Y3.N88:25/2732

NUREG/CR-2732
EGG-2196

ORIGINAL
COMPLETED
124

U.S. Department of Energy
Idaho Operations Office • Idaho National Engineering Laboratory

Experiment Data Report for Semiscale MOD-2A Intermediate Break Test Series (Tests S-IB-1 and S-IB-2)

Kenneth E. Sackett
L. Bruce Clegg

June 1982

Prepared for the
U.S. Nuclear Regulatory Commission
Under DOE Contract No. DE-AC07-76IDO1570

EG&G Idaho

I

BEST DOCUMENT AVAILABLE

NOTICE

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights.

Available from

GPO Sales Program
Division of Technical Information and Document Control
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

and

National Technical Information Service
Springfield, Virginia 22161

NUREG/CR-2732
EGG-2196
Distribution Category: R2

EXPERIMENT DATA REPORT FOR SEMISCALE MOD-2A INTERMEDIATE BREAK TEST SERIES (TESTS S-IB-1 AND S-IB-2)

Kenneth E. Sackett
L. Bruce Clegg

Published June 1982

EG&G Idaho, Inc.
Idaho Falls, Idaho 83415

Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under DOE Contract No. DE-AC07-76IDO1570
FIN No. A6038

III

ABSTRACT

This report presents test data recorded for Tests S-IB-1 and S-IB-2 of the Semiscale Mod-2A Intermediate Break Test Series. These tests are part of a series of Semiscale tests that investigate the thermal-hydraulic phenomena resulting from a hypothesized loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR) system. These tests provide experimental data for assessing the analytical capability of computer codes used in LOCA analysis.

The primary objective of these tests is to expand the break data base to cover the 10% to 200% range. Tests S-IB-1 and S-IB-2 were communicative in nature and incorporated a 100% and 50% break orifice, respectively.

Tests S-IB-1 and S-IB-2 were conducted from initial conditions closely approximating the specified initial conditions of: 15.5-MPa system pressure, 557-K cold leg temperature, and 1.95-MW core power level. This report presents uninterpreted data from both tests for future analysis. The data, presented as graphs in engineering units, have been analyzed only to the extent necessary to ensure that they are reasonable and consistent.

FIN No. A6038—Semiscale Program

SUMMARY

Tests S-IB-1 and S-IB-2 are two of several in the Semiscale Mod-2A Intermediate Break (IB) Test Series conducted by EG&G Idaho, Inc., for the United States Government. The IB Series investigates the thermal-hydraulic phenomena resulting from a hypothesized loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR) system, and provides experimental data that can be used to develop and assess the analytical capability of computer models designed to predict and analyze such phenomena. The objective of these tests is to expand the break data base to cover the 10% to 200% range. Tests S-IB-1 and S-IB-2 were communicative in nature, and incorporated 100% and 50% break orifices, respectively.

The Mod-2A system is equipped with a pressure vessel that contains an electrically heated core, other simulated reactor internals, and an external downcomer assembly; an intact loop with steam generator, pump, and pressurizer; a broken loop with steam generator, pump, and rupture disc assembly; and a pressure suppression system with header, suppression tank, and a steam supply system. High-pressure and low-pressure coolant injection pumps and coolant injection accumulators were provided for the intact and broken loops.

The specified initial conditions for Tests S-IB-1 and S-IB-2 included system pressure of 15.5 MPa, core inlet temperature of 557 K, and core differential temperature of 37 K. The simulated intermediate break [volume-scaled to represent 100% (S-IB-1) and 50% (S-IB-2) of the area of a PWR cold-leg pipe] was located on the centerline of the broken-loop piping between the pump and the vessel. After initiation of blowdown, power to the electrically heated core was computer controlled and programmed to simulate the predicted heat flux response of nuclear fuel rods during a LOCA.

Tests S-IB-1 and S-IB-2 generally proceeded as specified. Conditions that did not conform to the specified test configuration were considered acceptable for analysis within the test objectives. Of 301 and 300 measurements taken for Tests S-IB-1 and S-IB-2, respectively, 296 and 299 produced usable data. Test data are available from the NRC/RSR Data Bank at the Idaho National Engineering Laboratory. Address inquiries to EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls, Idaho 83415.

CONTENTS

ABSTRACT ii

SUMMARY iii

1. INTRODUCTION 1

2. SYSTEM, PROCEDURES, CONDITIONS, AND EVENTS FOR TESTS S-IB-1 AND S-IB-2 2

   System Configuration 2

   Test Preparation 2

   Warmup 2

   Test Sequence 2

   Tabular Data for Test Conditions 3

3. DATA PRESENTATION 7

4. REFERENCES 34

FIGURES

1. Semiscale Mod-2A system configuration for cold-leg intermediate-break test—isometric 22

2. Semiscale Mod-2A system configuration for cold-leg intermediate-break test—schematic 23

3. Semiscale Mod-2A pressure vessel and downcomer—cross section 24

4. Semiscale Mod-2A pressure vessel showing penetrations— isometric 25

5. Semiscale Mod-2A downcomer showing penetrations—isometric 26

6. Semiscale Mod-2A steam generator—cross section 27

7. Semiscale Mod-2A intact loop steam generator tubes—horizontal cross section 28

8. Semiscale Mod-2A broken loop steam generator tubes—horizontal cross section 29

9. Semiscale Mod-2A intact loop steam generator thermocouple locations 30

10. Semiscale Mod-2A broken loop steam generator thermocouple locations 31

11. Semiscale Mod-2A intact and broken loop steam generator thermocouple installation 32

12. Semiscale Mod-2A heated core plan view 33

NOTE: Figures 13 through 613 are presented on microfiche attached to the inside of the back cover.

Microfiche sheet 001

13. Fluid temperature in intact loop hot leg, Test S-IB-1 (TFI*1) .....
14. Fluid temperature in intact loop hot leg, Test S-IB-2 (TFI*1) .....
15. Fluid temperature in intact loop hot leg, Test S-IB-1 (TFI*5) .....
16. Fluid temperature in intact loop hot leg, Test S-IB-2 (TFI*5) .....
17. Fluid temperature in intact loop cold leg, Test S-IB-1 (TFI*9) .....
18. Fluid temperature in intact loop cold leg, Test S-IB-2 (TFI*9) .....
19. Fluid temperature in intact loop cold leg, Test S-IB-1 (TFI*15) .....
20. Fluid temperature in intact loop cold leg, Test S-IB-2 (TFI*15) .....
21. Fluid temperature in intact loop pump suction, Test S-IB-1 (TFI*17) .....
22. Fluid temperature in intact loop pump suction, Test S-IB-2 (TFI*17) .....
23. Fluid temperature in intact loop cold leg, Test S-IB-1 (TFI*21) .....
24. Fluid temperature in intact loop cold leg, Test S-IB-2 (TFI*21) .....
25. Fluid temperature in intact loop cold leg, Test S-IB-1 (TFI*22) .....
26. Fluid temperature in intact loop cold leg, Test S-IB-2 (TFI*22) .....
27. Fluid temperature in broken loop hot leg, Test S-IB-1 (TFB*50) .....
28. Fluid temperature in broken loop hot leg, Test S-IB-2 (TFB*50) .....
29. Fluid temperature in broken loop hot leg, Test S-IB-1 (TFB*57) .....
30. Fluid temperature in broken loop hot leg, Test S-IB-2 (TFB*57) .....
31. Fluid temperature in broken loop cold leg, Test S-IB-1 (TFB*62) .....
32. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*62) .....
33. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*64) .....
34. Fluid temperature in broken loop cold leg, Test S-IB-1 (TFB*73) .....
35. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*73) .....
36. Fluid temperature in broken loop cold leg, Test S-IB-1 (TFB*74) .....
37. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*74) .....
38. Fluid temperature in broken loop cold leg, Test S-IB-1 (TFB*76U) .....

Microfiche sheet 001

39. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*76U) .....
40. Fluid temperature in broken loop cold leg, Test S-IB-1 (TFB*76) .....
41. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*76) .....
42. Fluid temperature in broken loop cold leg, Test S-IB-1 (TFB*79) .....
43. Fluid temperature in broken loop cold leg, Test S-IB-2 (TFB*79) .....
44. Fluid temperature in vessel downcomer, Test S-IB-1 (TFV*DC-84) .....
45. Fluid temperature in vessel downcomer, Test S-IB-2 (TFV*DC-84) .....
46. Fluid temperature in vessel downcomer, Test S-IB-1 (TFV*DC-270) .....
47. Fluid temperature in vessel downcomer, Test S-IB-2 (TFV*DC-270) .....
48. Fluid temperature in vessel downcomer, Test S-IB-1 (TFV*DC-436) .....
49. Fluid temperature in vessel downcomer, Test S-IB-2 (TFV*DC-436) .....
50. Fluid temperature in vessel lower plenum, Test S-IB-1 (TFV*LP-552) .....
51. Fluid temperature in vessel lower plenum, Test S-IB-2 (TFV*LP-552) .....
52. Fluid temperature in vessel upper plenum, Test S-IB-1 (TFV*UP-63) .....
53. Fluid temperature in vessel upper plenum, Test S-IB-2 (TFV*UP-63) .....
54. Fluid temperature in vessel upper plenum, Test S-IB-1 (TFV*UPM-13) .....
55. Fluid temperature in vessel upper plenum, Test S-IB-2 (TFV*UPM-13) .....
56. Fluid temperature in vessel upper plenum, Test S-IB-1 (TFV*UP + 79) .....
57. Fluid temperature in vessel upper plenum, Test S-IB-2 (TFV*UP + 79) .....
58. Fluid temperature in vessel upper head, Test S-IB-1 (TFV + UHQ180) .....
59. Fluid temperature in vessel upper head, Test S-IB-2 (TFV + UHQ180) .....
60. Fluid temperature in vessel upper head, Test S-IB-1 (TFV + UHQ282) .....
61. Fluid temperature in vessel upper head, Test S-IB-2 (TFV + UHQ282) .....
62. Fluid temperature in vessel upper head, Test S-IB-1 (TFV*UH + 343) .....
63. Fluid temperature in vessel upper head, Test S-IB-2 (TFV*UH + 343) .....
64. Fluid temperature in vessel upper head, Test S-IB-1 (TFV*UH + 402) .....

Microfiche sheet 001

65. Fluid temperature in vessel upper head, Test S-IB-2 (TFV*UH + 402) .....

66. Fluid temperature in vessel upper plenum bypass line, Test S-IB-1 (TFV*BYPASS) .....

67. Fluid temperature in vessel upper plenum bypass line, Test S-IB-2 (TFV*BYPASS) .....

68. Fluid temperature in core, grid spacer 2, Test S-IB-2 (TFV*B3 + 46) .....

69. Fluid temperature in core, grid spacer 3, Test S-IB-1 (TFV*A4 + 86) .....

70. Fluid temperature in core, grid spacer 3, Test S-IB-2 (TFV*A4 + 86) .....

71. Fluid temperature in core, grid spacer 4, Test S-IB-1 (TFV*B3 + 126) .....

72. Fluid temperature in core, grid spacer 4, Test S-IB-2 (TFV*B3 + 126) .....

73. Fluid temperature in core, grid spacer 4, Test S-IB-2 (TFV*D1 + 126) .....

74. Fluid temperature in core, grid spacer 5, Test S-IB-2 (TFV*A4 + 166) .....

75. Fluid temperature in core, grid spacer 5, Test S-IB-1 (TFV*B3 + 166) .....

76. Fluid temperature in core, grid spacer 5, Test S-IB-2 (TFV*B3 + 166) .....

77. Fluid temperature in core, grid spacer 5, Test S-IB-1 (TFV*D1 + 166) .....

78. Fluid temperature in core, grid spacer 5, Test S-IB-2 (TFV*D1 + 166) .....

79. Fluid temperature in core, grid spacer 7, Test S-IB-1 (TFV*A4 + 246) .....

80. Fluid temperature in core, grid spacer 7, Test S-IB-2 (TFV*A4 + 246) .....

81. Fluid temperature in core, grid spacer 7, Test S-IB-1 (TFV*B3 + 246) .....

82. Fluid temperature in core, grid spacer 7, Test S-IB-2 (TFV*B3 + 246) .....

83. Fluid temperature in core, grid spacer 8, Test S-IB-1 (TFV*A4 + 286) .....

84. Fluid temperature in core, grid spacer 8, Test S-IB-2 (TFV*A4 + 286) .....

85. Fluid temperature in core, grid spacer 9, Test S-IB-1 (TFV*A4 + 326) .....

86. Fluid temperature in core, grid spacer 9, Test S-IB-2 (TFV*A4 + 326) .....

87. Fluid temperature in core, grid spacer 9, Test S-IB-1 (TFV*B3 + 326) .....

88. Fluid temperature in core, grid spacer 9, Test S-IB-2 (TFV*B3 + 326) .....

89. Fluid temperature in core, grid spacer 9, Test S-IB-1 (TFV*D1 + 326) .....

90. Fluid temperature in core, grid spacer 9, Test S-IB-2 (TFV*D1 + 326) .....

Microfiche sheet 001

91. Fluid temperature in core, grid spacer 10, Test S-IB-1 (TFV*A4 + 366) .....

92. Fluid temperature in core, grid spacer 10, Test S-IB-2 (TFV*A4 + 366) .....

93. Fluid temperature in intact loop steam generator, primary side, Test S-IB-1 (TFIP + LH30) .....

94. Fluid temperature in intact loop steam generator, primary side, Test S-IB-2 (TFIP + LH30) .....

95. Fluid temperature in intact loop steam generator, primary side, Test S-IB-1 (TFIP + LH452) .....

96. Fluid temperature in intact loop steam generator, primary side, Test S-IB-2 (TFIP + LH452) .....

97. Fluid temperature in intact loop steam generator, primary side, Test S-IB-1 (TFIP + LH922) .....

98. Fluid temperature in intact loop steam generator, primary side, Test S-IB-2 (TFIP + LH922) .....

99. Fluid temperature in intact loop steam generator, primary side, Test S-IB-1 (TFIP + LC211) .....

100. Fluid temperature in intact loop steam generator, primary side, Test S-IB-2 (TFIP + LC211) .....

101. Fluid temperature in broken loop steam generator, primary side, Test S-IB-1 (TFBP + LH211) .....

102. Fluid temperature in broken loop steam generator, primary side, Test S-IB-2 (TFBP + LH211) .....

103. Fluid temperature in broken loop steam generator, primary side, Test S-IB-1 (TFBP + LH452) .....

104. Fluid temperature in broken loop steam generator, primary side, Test S-IB-2 (TFBP + LH452) .....

105. Fluid temperature in broken loop steam generator, primary side, Test S-IB-1 (TFBP + LH668) .....

106. Fluid temperature in broken loop steam generator, primary side, Test S-IB-2 (TFBP + LH668) .....

107. Fluid temperature in broken loop steam generator, primary side, Test S-IB-1 (TFBP + LH922) .....

108. Fluid temperature in broken loop steam generator, primary side, Test S-IB-2 (TFBP + LH922) .....

Microfiche sheet 001

109. Fluid temperature of feedwater for intact loop steam generator at flow orifice, Test S-IB-1 (TFSC*IGFDW) .....

110. Fluid temperature of feedwater for intact loop steam generator at flow orifice, Test S-IB-2 (TFSC*IGFDW) .....

111. Fluid temperature of feedwater for intact loop steam generator at lower injection port, Test S-IB-1 (TFSC*IGFWL) .....

112. Fluid temperature of feedwater for intact loop steam generator at lower injection port, Test S-IB-2 (TFSC*IGFWL) .....

113. Fluid temperature in intact loop steam generator, secondary side downcomer, Test S-IB-1 (TFIS*D+152) .....

114. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-1 (TFIS+LH30) .....

115. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-2 (TFIS+LH30) .....

116. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-1 (TFIS+LC211) .....

117. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-2 (TFIS+LC211) .....

118. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-1 (TFIS+LH452) .....

119. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-2 (TFIS+LH452) .....

120. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-1 (TFIS+LH922) .....

121. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-2 (TFIS+LH922) .....

122. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-1 (TFIS+1117) .....

123. Fluid temperature in intact loop steam generator, secondary side, Test S-IB-2 (TFIS+1117) .....

124. Steam temperature at flow orifice, intact loop steam generator, Test S-IB-1 (TFSC*IGSTM) .....

125. Steam temperature at flow orifice, intact loop steam generator, Test S-IB-2 (TFSC*IGSTM) .....

126. Fluid temperature of feedwater for broken loop steam generator at flow orifice, Test S-IB-1 (TFSC*BGFDW) .....

Microfiche sheet 001

127. Fluid temperature of feedwater for broken loop steam generator at flow orifice, Test S-IB-2 (TFSC*BGFDW) .....

128. Fluid temperature of feedwater for broken loop steam generator at lower injection port, Test S-IB-1 (TFSC*BGFWL) .....

129. Fluid temperature of feedwater for broken loop steam generator at lower injection port, Test S-IB-2 (TFSC*BGFWL) .....

130. Fluid temperature in broken loop steam generator, secondary side downcomer, Test S-IB-1 (TFBS*D+152) .....

131. Fluid temperature in broken loop steam generator, secondary side downcomer, Test S-IB-1 (TFBS*D+457) .....

132. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-1 (TFBS+LH211) .....

133. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-2 (TFBS+LH211) .....

134. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-1 (TFBS+LH452) .....

135. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-2 (TFBS+LH452) .....

136. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-1 (TFBS+LH668) .....

137. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-2 (TFBS+LH668) .....

138. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-1 (TFBS+LH922) .....

139. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-2 (TFBS+LH922) .....

140. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-1 (TFBS+1117) .....

141. Fluid temperature in broken loop steam generator, secondary side, Test S-IB-2 (TFBS+1117) .....

142. Steam temperature at flow orifice, broken loop steam generator, Test S-IB-1 (TFSC*BGSTM) .....

143. Steam temperature at flow orifice, broken loop steam generator, Test S-IB-2 (TFSC*BGSTM) .....

144. Fluid temperature in pressurizer, Test S-IB-1 (TF*PRZ+132) .....

Microfiche sheet 001

145. Fluid temperature in pressurizer, Test S-IB-2 (TF*PRZ+132) .....

146. Fluid temperature in pressurizer, Test S-IB-1 (TF*PRZ-73) .....

147. Fluid temperature in pressurizer, Test S-IB-2 (TF*PRZ-73) .....

148. Fluid temperature in pressurizer surge line at junction with Spool 3, Test S-IB-1 (TF*PRZ*I3) .....

149. Fluid temperature in pressurizer surge line at junction with Spool 3, Test S-IB-2 (TF*PRZ*I3) .....

150. Fluid temperature in coolant injection line for intact loop, Test S-IB-1 (TFCI*I22) .....

151. Fluid temperature in coolant injection line for intact loop, Test S-IB-2 (TFCI*I22) .....

152. Fluid temperature in accumulator for intact loop, Test S-IB-1 (TFCI*A3+76) .....

153. Fluid temperature in accumulator for intact loop, Test S-IB-2 (TFCI*A3+76) .....

154. Fluid temperature in intact loop HPIS water supply tank, Test S-IB-2 (TFCI*T7+0) .....

155. Fluid temperature in pressure suppression tank, Test S-IB-1 (TFPS*1T+43) .....

156. Fluid temperature in pressure suppression tank, Test S-IB-2 (TFPS*1T+43) .....

157. Fluid temperature in pressure suppression tank, Test S-IB-1 (TFPS*1T+330) .....

158. Fluid temperature in pressure suppression tank, Test S-IB-2 (TFPS*1T+330) .....

159. Metal temperature, vessel upper head filler piece, Test S-IB-1 (TMV+FPF221) .....

160. Metal temperature, vessel upper head filler piece, Test S-IB-2 (TMV+FPF221) .....

161. Metal temperature, vessel upper head filler piece, Test S-IB-1 (TMV*FPD+79) .....

162. Metal temperature, vessel upper head filler piece, Test S-IB-2 (TMV*FPD+79) .....

163. Metal temperature, vessel thermal shield, Test S-IB-1 (TMV+TSQ221) .....

164. Metal temperature, vessel thermal shield, Test S-IB-2 (TMV+TSQ221) .....

165. Core heater temperature, Rod B-2 Test S-IB-2 (THV*B2+107) .....

166. Core heater temperature, Rod B-2, Test S-IB-1 (THV*B2+180) .....

167. Core heater temperature, Rod B-2, Test S-IB-2 (THV*B2+180) .....

168. Core heater temperature, Rod B-2, Test S-IB-1 (THV*B2+227) .....

169. Core heater temperature, Rod B-2, Test S-IB-2 (THV*B2+227) .....

170. Core heater temperature, Rod B-2, Test S-IB-2 (THV*B2+353) .....

Microfiche sheet 001

171. Core heater temperature, Rod B-3, Test S-IB-1 (THV*B3+114) .....

172. Core heater temperature, Rod B-3, Test S-IB-2 (THV*B3+114) .....

173. Core heater temperature, Rod B-3, Test S-IB-2 (THV*B3+184) .....

174. Core heater temperature, Rod B-3, Test S-IB-1 (THV*B3+229) .....

175. Core heater temperature, Rod B-3, Test S-IB-2 (THV*B3+229) .....

176. Core heater temperature, Rod B-3, Test S-IB-1 (THV*B3+354) .....

177. Core heater temperature, Rod B-3, Test S-IB-2 (THV*B3+354) .....

178. Core heater temperature, Rod B-4, Test S-IB-1 (THV*B4-12) .....

179. Core heater temperature, Rod B-4, Test S-IB-2 (THV*B4-12) .....

180. Core heater temperature, Rod B-4, Test S-IB-2 (THV*B4+140) .....

181. Core heater temperature, Rod B-4, Test S-IB-1 (THV*B4+170) .....

182. Core heater temperature, Rod B-4, Test S-IB-2 (THV*B4+170) .....

183. Core heater temperature, Rod B-4, Test S-IB-1 (THV*B4+256) .....

184. Core heater temperature, Rod B-4, Test S-IB-2 (THV*B4+256) .....

185. Core heater temperature, Rod C-2, Test S-IB-1 (THV*C2+15) .....

186. Core heater temperature, Rod C-2, Test S-IB-2 (THV*C2+15) .....

187. Core heater temperature, Rod C-2, Test S-IB-1 (THV*C2+137) .....

188. Core heater temperature, Rod C-2, Test S-IB-2 (THV*C2+137) .....

189. Core heater temperature, Rod C-2, Test S-IB-1 (THV*C2+168) .....

190. Core heater temperature, Rod C-2, Test S-IB-2 (THV*C2+168) .....

191. Core heater temperature, Rod C-2, Test S-IB-1 (THV*C2+254) .....

192. Core heater temperature, Rod C-2, Test S-IB-2 (THV*C2+254) .....

193. Core heater temperature, Rod C-3, Test S-IB-1 (THV*C3+140) .....

194. Core heater temperature, Rod C-3, Test S-IB-2 (THV*C3+140) .....

195. Core heater temperature, Rod C-3, Test S-IB-1 (THV*C3+231) .....

196. Core heater temperature, Rod C-3, Test S-IB-2 (THV*C3+231) .....

197. Core heater temperature, Rod C-3, Test S-IB-1 (THV*C3+292) .....

Microfiche sheet 001

198. Core heater temperature, Rod C-3, Test S-IB-2 (THV*C3+292) .....

199. Core heater temperature, Rod C-4, Test S-IB-1 (THV*C4+20) .....

200. Core heater temperature, Rod C-4, Test S-IB-2 (THV*C4+20) .....

201. Core heater temperature, Rod C-4, Test S-IB-1 (THV*C4+142) .....

202. Core heater temperature, Rod C-4, Test S-IB-2 (THV*C4+142) .....

203. Core heater temperature, Rod C-4, Test S-IB-1 (THV*C4+187) .....

204. Core heater temperature, Rod C-4, Test S-IB-2 (THV*C4+187) .....

205. Core heater temperature, Rod C-4, Test S-IB-1 (THV*C4+257) .....

206. Core heater temperature, Rod C-4, Test S-IB-2 (THV*C4+257) .....

207. Core heater temperature, Rod D-2, Test S-IB-1 (THV*D2+16) .....

208. Core heater temperature, Rod D-2, Test S-IB-2 (THV*D2+16) .....

209. Core heater temperature, Rod D-2, Test S-IB-1 (THV*D2+138) .....

210. Core heater temperature, Rod D-2, Test S-IB-2 (THV*D2+138) .....

211. Core heater temperature, Rod D-2, Test S-IB-1 (THV*D2+185) .....

212. Core heater temperature, Rod D-2, Test S-IB-2 (THV*D2+185) .....

213. Core heater temperature, Rod D-2, Test S-IB-1 (THV*D2+254) .....

214. Core heater temperature, Rod D-2, Test S-IB-2 (THV*D2+254) .....

215. Core heater temperature, Rod D-3, Test S-IB-1 (THV*D3+109) .....

216. Core heater temperature, Rod D-3, Test S-IB-2 (THV*D3+109) .....

217. Core heater temperature, Rod D-3, Test S-IB-1 (THV*D3+227) .....

218. Core heater temperature, Rod D-3, Test S-IB-2 (THV*D3+227) .....

219. Core heater temperature, Rod D-3, Test S-IB-1 (THV*D3+354) .....

220. Core heater temperature, Rod D-3, Test S-IB-2 (THV*D3+354) .....

221. Core heater temperature, Rod D-4, Test S-IB-1 (THV*D4+179) .....

222. Core heater temperature, Rod D-4, Test S-IB-2 (THV*D4+179) .....

223. Core heater temperature, Rod D-4, Test S-IB-1 (THV*D4+226) .....

Microfiche sheet 001

224. Core heater temperature, Rod D-4, Test S-IB-2 (THV*D4+2) .....

225. Core heater temperature, Rod D-4, Test S-IB-1 (THV*D4+352) .....

226. Core heater temperature, Rod D-4, Test S-IB-2 (THV*D4+352) .....

227. Core heater temperature, Rod A-1, Test S-IB-1 (THV*A1+115) .....

228. Core heater temperature, Rod A-1, Test S-IB-2 (THV*A1+115) .....

229. Core heater temperature, Rod A-2, Test S-IB-1 (THV*A2+112) .....

230. Core heater temperature, Rod A-2, Test S-IB-2 (THV*A2+112) .....

231. Core heater temperature, Rod A-2, Test S-IB-1 (THV*A2+182) .....

232. Core heater temperature, Rod A-2, Test S-IB-2 (THV*A2+182) .....

233. Core heater temperature, Rod A-2, Test S-IB-1 (THV*A2+353) .....

234. Core heater temperature, Rod A-2, Test S-IB-2 (THV*A2+353) .....

235. Core heater temperature, Rod A-3, Test S-IB-1 (THV*A3+137) .....

236. Core heater temperature, Rod A-3, Test S-IB-2 (THV*A3+137) .....

237. Core heater temperature, Rod A-3, Test S-IB-1 (THV*A3+208) .....

238. Core heater temperature, Rod A-3, Test S-IB-2 (THV*A3+208) .....

239. Core heater temperature, Rod A-3, Test S-IB-1 (THV*A3+228) .....

240. Core heater temperature, Rod A-3, Test S-IB-2 (THV*A3+228) .....

241. Core heater temperature, Rod A-3, Test S-IB-1 (THV*A3+291) .....

242. Core heater temperature, Rod A-3, Test S-IB-2 (THV*A3+291) .....

243. Core heater temperature, Rod A-4, Test S-IB-1 (THV*A4+115) .....

244. Core heater temperature, Rod A-4, Test S-IB-2 (THV*A4+115) .....

245. Core heater temperature, Rod A-4, Test S-IB-1 (THV*A4+185) .....

246. Core heater temperature, Rod A-4, Test S-IB-2 (THV*A4+185) .....

247. Core heater temperature, Rod A-4, Test S-IB-1 (THV*A4+355) .....

248. Core heater temperature, Rod A-4, Test S-IB-2 (THV*A4+355) .....

249. Core heater temperature, Rod A-5, Test S-IB-1 (THV*A5+185) .....

Microfiche sheet 001

250. Core heater temperature, Rod A-5, Test S-IB-2 (THV*A5 + 185) .....

251. Core heater temperature, Rod B-1, Test S-IB-1 (THV*B1 + 11) .....

252. Core heater temperature, Rod B-1, Test S-IB-2 (THV*B1 + 11) .....

253. Core heater temperature, Rod B-1, Test S-IB-1 (THV*B1 + 183) .....

254. Core heater temperature, Rod B-1, Test S-IB-2 (THV*B1 + 183) .....

255. Core heater temperature, Rod B-1, Test S-IB-1 (THV*B1 + 253) .....

256. Core heater temperature, Rod B-1, Test S-IB-2 (THV*B1 + 253) .....

257. Core heater temperature, Rod B-5, Test S-IB-1 (THV*B5 + 133) .....

258. Core heater temperature, Rod B-5, Test S-IB-2 (THV*B5 + 133) .....

259. Core heater temperature, Rod B-5, Test S-IB-1 (THV*B5 + 180) .....

260. Core heater temperature, Rod B-5, Test S-IB-2 (THV*B5 + 180) .....

261. Core heater temperature, Rod B-5, Test S-IB-1 (THV*B5 + 252) .....

262. Core heater temperature, Rod B-5, Test S-IB-2 (THV*B5 + 252) .....

263. Core heater temperature, Rod C-1, Test S-IB-1 (THV*C1 + 140) .....

264. Core heater temperature, Rod C-1, Test S-IB-2 (THV*C1 + 140) .....

265. Core heater temperature, Rod C-1, Test S-IB-1 (THV*C1 + 211) .....

266. Core heater temperature, Rod C-1, Test S-IB-2 (THV*C1 + 211) .....

267. Core heater temperature, Rod C-1, Test S-IB-1 (THV*C1 + 232) .....

268. Core heater temperature, Rod C-1, Test S-IB-2 (THV*C1 + 232) .....

269. Core heater temperature, Rod C-1, Test S-IB-1 (THV*C1 + 292) .....

270. Core heater temperature, Rod C-1, Test S-IB-2 (THV*C1 + 292) .....

271. Core heater temperature, Rod C-5, Test S-IB-1 (THV*C5 + 133) .....

272. Core heater temperature, Rod C-5, Test S-IB-2 (THV*C5 + 133) .....

273. Core heater temperature, Rod C-5, Test S-IB-1 (THV*C5 + 207) .....

274. Core heater temperature, Rod C-5, Test S-IB-2 (THV*C5 + 207) .....

275. Core heater temperature, Rod C-5, Test S-IB-1 (THV*C5 + 228) .....

Microfiche sheet 001

276. Core heater temperature, Rod C-5, Test S-IB-2 (THV*C5 + 228) .....
277. Core heater temperature, Rod C-5, Test S-IB-1 (THV*C5 + 290) .....
278. Core heater temperature, Rod C-5, Test S-IB-2 (THV*C5 + 290) .....
279. Core heater temperature, Rod D-1, Test S-IB-1 (THV*D1 + 131) .....
280. Core heater temperature, Rod D-1, Test S-IB-2 (THV*D1 + 131) .....

Microfiche sheet 002

281. Core heater temperature, Rod D-1, Test S-IB-1 (THV*D1 + 178) .....
282. Core heater temperature, Rod D-1, Test S-IB-2 (THV*D1 + 178) .....
283. Core heater temperature, Rod D-1, Test S-IB-1 (THV*D1 + 251) .....
284. Core heater temperature, Rod D-1, Test S-IB-2 (THV*D1 + 251) .....
285. Core heater temperature, Rod D-5, Test S-IB-1 (THV*D5 + 13) .....
286. Core heater temperature, Rod D-5, Test S-IB-2 (THV*D5 + 13) .....
287. Core heater temperature, Rod D-5, Test S-IB-1 (THV*D5 + 139) .....
288. Core heater temperature, Rod D-5, Test S-IB-2 (THV*D5 + 139) .....
289. Core heater temperature, Rod D-5, Test S-IB-1 (THV*D5 + 184) .....
290. Core heater temperature, Rod D-5, Test S-IB-2 (THV*D5 + 184) .....
291. Core heater temperature, Rod E-1, Test S-IB-1 (THV*E1 + 172) .....
292. Core heater temperature, Rod E-1, Test S-IB-2 (THV*E1 + 172) .....
293. Core heater temperature, Rod E-2, Test S-IB-1 (THV*E2 + 109) .....
294. Core heater temperature, Rod E-2, Test S-IB-2 (THV*E2 + 109) .....
295. Core heater temperature, Rod E-2, Test S-IB-1 (THV*E2 + 181) .....
296. Core heater temperature, Rod E-2, Test S-IB-2 (THV*E2 + 181) .....
297. Core heater temperature, Rod E-2, Test S-IB-1 (THV*E2 + 354) .....
298. Core heater temperature, Rod E-2, Test S-IB-2 (THV*E2 + 354) .....
299. Core heater temperature, Rod E-3, Test S-IB-1 (THV*E3 + 141) .....
300. Core heater temperature, Rod E-3, Test S-IB-2 (THV*E3 + 141) .....

Microfiche sheet 002

301. Core heater temperature, Rod E-3, Test S-IB-1 (THV*E3+211) .....

302. Core heater temperature, Rod E-3, Test S-IB-2 (THV*E3+211) .....

303. Core heater temperature, Rod E-3, Test S-IB-1 (THV*E3+231) .....

304. Core heater temperature, Rod E-3, Test S-IB-2 (THV*E3+231) .....

305. Core heater temperature, Rod E-3, Test S-IB-1 (THV*E3+292) .....

306. Core heater temperature, Rod E-3, Test S-IB-2 (THV*E3+292) .....

307. Core heater temperature, Rod E-4, Test S-IB-1 (THV*E4+112) .....

308. Core heater temperature, Rod E-4, Test S-IB-2 (THV*E4+112) .....

309. Core heater temperature, Rod E-4, Test S-IB-1 (THV*E4+183) .....

310. Core heater temperature, Rod E-4, Test S-IB-2 (THV*E4+183) .....

311. Core heater temperature, Rod E-4, Test S-IB-1 (THV*E4+354) .....

312. Core heater temperature, Rod E-4, Test S-IB-2 (THV*E4+354) .....

313. Core heater temperature, Rod E-5, Test S-IB-1 (THV*E5+181) .....

314. Pressure in intact loop hot leg, Test S-IB-1 (PI*1) .....

315. Pressure in intact loop hot leg, Test S-IB-2 (PI*1) .....

316. Pressure in intact loop pump suction, Test S-IB-1 (PI*14L) .....

317. Pressure in intact loop pump suction, Test S-IB-2 (PI*14L) .....

318. Pressure in intact loop cold leg, Test S-IB-1 (PI*22L) .....

319. Pressure in intact loop cold leg, Test S-IB-2 (PI*22L) .....

320. Pressure in broken loop hot leg, Test S-IB-1 (PB*50) .....

321. Pressure in broken loop hot leg, Test S-IB-2 (PB*50) .....

322. Pressure in broken loop pump suction, Test S-IB-2 (PB*65) .....

323. Pressure in broken loop cold leg, Test S-IB-1 (PB*74L) .....

324. Pressure in broken loop cold leg, Test S-IB-2 (PB*74L) .....

325. Pressure in broken loop cold leg, Test S-IB-1 (PB*76U) .....

326. Pressure in broken loop cold leg, Test S-IB-2 (PB*76U) .....

Microfiche sheet 002

327. Pressure in broken loop cold leg, Test S-IB-2 (PB*76D) .....

328. Pressure in broken loop cold leg, Test S-IB-2 (PB*76D(L)) .....

329. Pressure in broken loop cold leg, Test S-IB-1 (PB*79L) .....

330. Pressure in broken loop cold leg, Test S-IB-2 (PB*79L) .....

331. Pressure in vessel downcomer, Test S-IB-1 (PV*DC+29) .....

332. Pressure in vessel downcomer, Test S-IB-2 (PV*DC+29) .....

333. Pressure in vessel downcomer, Test S-IB-1 (PV*DC-435L) .....

334. Pressure in vessel downcomer, Test S-IB-2 (PV*DC-435L) .....

335. Pressure in vessel lower plenum, Test S-IB-1 (PV*LP-578L) .....

336. Pressure in vessel lower plenum, Test S-IB-2 (PV*LP-578L) .....

337. Pressure in vessel upper plenum, Test S-IB-1 (PV*UP-13) .....

338. Pressure in vessel upper plenum, Test S-IB-2 (PV*UP-13) .....

339. Pressure in vessel upper head, Test S-IB-1 (PV*UH+421) .....

340. Pressure in vessel upper head, Test S-IB-2 (PV*UH+421) .....

341. Pressure in accumulator for intact loop, Test S-IB-1 (PCI*A3+277) .....

342. Pressure in accumulator for intact loop, Test S-IB-2 (PCI*A3+277) .....

343. Pressure in intact loop steam generator steam dome, Test S-IB-1 (PIS+1117) .....

344. Pressure in intact loop steam generator steam dome, Test S-IB-2 (PIS+1117) .....

345. Pressure in broken loop steam generator steam dome, Test S-IB-2 (PBS+1117) .....

346. Pressure in intact loop steam generator discharge line, Test S-IB-1 (PSC*IGSTM) .....

347. Pressure in intact loop steam generator discharge line, Test S-IB-2 (PSC*IGSTM) .....

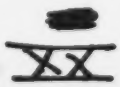
348. Pressure in broken loop steam generator discharge line, Test S-IB-1 (PSC*BGSTM) .....

349. Pressure in broken loop steam generator discharge line, Test S-IB-2 (PSC*BGSTM) .....

350. Pressure in pressurizer steam dome, Test S-IB-1 (P*PRZ+146) .....

351. Pressure in pressurizer steam dome, Test S-IB-2 (P*PRZ+146) .....

352. Pressure in pressure suppression tank, Test S-IB-1 (PPS*1T+384) .....



Microfiche sheet 002

353. Pressure in pressure suppression tank, Test S-IB-2 (PPS*1T + 384) .....

354. Differential pressure in intact loop hot leg, Test S-IB-1 (D-V13A*I1) .....

355. Differential pressure in intact loop hot leg, Test S-IB-2 (D-V13A*I1) .....

356. Differential pressure in intact loop hot leg, Test S-IB-1 (DPI*1*3C) .....

357. Differential pressure in intact loop hot leg, Test S-IB-2 (DPI*1*3C) .....

358. Differential pressure in intact loop hot leg, Test S-IB-1 (DPI*3C*5) .....

359. Differential pressure in intact loop hot leg, Test S-IB-2 (DPI*3C*5) .....

360. Differential pressure across intact loop steam generator plenum, Test S-IB-1 (DIG-55E55X) .....

361. Differential pressure in intact loop cold leg, Test S-IB-1 (DPI*5*9) .....

362. Differential pressure in intact loop cold leg, Test S-IB-2 (DPI*5*9) .....

363. Differential pressure in intact loop cold leg, Test S-IB-1 (DPI*9*14) .....

364. Differential pressure in intact loop cold leg, Test S-IB-2 (DPI*9*14) .....

365. Differential pressure in intact loop cold leg, Test S-IB-2 (DPI*14*18) .....

366. Differential pressure across intact loop pump, Test S-IB-1 (DPI*21*18) .....

367. Differential pressure across intact loop pump, Test S-IB-2 (DPI*21*18) .....

368. Differential pressure in intact loop, Test S-IB-1 (DPI*21*22) .....

369. Differential pressure in intact loop, Test S-IB-2 (DPI*21*22) .....

370. Differential pressure in intact loop cold leg, Test S-IB-1 (D*I22 + VD29) .....

371. Differential pressure in intact loop cold leg, Test S-IB-2 (D*I22 + VD29) .....

372. Differential pressure in broken loop hot leg, Test S-IB-1 (D-V13A*B50) .....

373. Differential pressure in broken loop hot leg, Test S-IB-2 (D-V13A*B50) .....

374. Differential pressure in broken loop hot leg, Test S-IB-1 (DPB*50*55) .....

375. Differential pressure in broken loop hot leg, Test S-IB-2 (DPB*50*55) .....

376. Differential pressure in broken loop hot leg, Test S-IB-1 (DPB*55*57) .....

377. Differential pressure in broken loop hot leg, Test S-IB-2 (DPB*55*57) .....

378. Differential pressure across broken loop steam generator plenum, Test S-IB-1 (DBG-55E55X) .....

Microfiche sheet 002

379. Differential pressure in broken loop cold leg, Test S-IB-1 (DPB*57*62) .....

380. Differential pressure in broken loop cold leg, Test S-IB-2 (DPB*57*62) .....

381. Differential pressure in broken loop cold leg, Test S-IB-1 (DPB*62*65) .....

382. Differential pressure in broken loop cold leg, Test S-IB-2 (DPB*62*65) .....

383. Differential pressure in broken loop cold leg, Test S-IB-1 (DPB*65*73) .....

384. Differential pressure in broken loop cold leg, Test S-IB-2 (DPB*65*73) .....

385. Differential pressure across broken loop pump, Test S-IB-1 (DPB*74*73) .....

386. Differential pressure across broken loop pump, Test S-IB-2 (DPB*74*73) .....

387. Differential pressure in broken loop cold leg, Test S-IB-1 (DPB*74*76U) .....

388. Differential pressure in broken loop cold leg, Test S-IB-2 (DPB*74*76U) .....

389. Differential pressure across break orifice, Test S-IB-1 (DPB*76U*76D) .....

390. Differential pressure across break orifice, Test S-IB-2 (DPB*76U*76D) .....

391. Differential pressure across break spool instrumented washer, Test S-IB-1 (DB*76F*76D) ....

392. Differential pressure across break spool instrumented washer, Test S-IB-2 (DB*76F*76D) ....

393. Differential pressure in broken loop cold leg, Test S-IB-1 (DPB*76U*79) .....

394. Differential pressure in broken loop cold leg, Test S-IB-2 (DPB*76U*79) .....

395. Differential pressure in broken loop cold leg, Test S-IB-1 (D*B79 + VD29) .....

396. Differential pressure in broken loop cold leg, Test S-IB-1 (D*B79 + VD29) .....

397. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-1 (DPB.50D*76) .....

398. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-2 (DPB.50D*76) .....

399. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-1 (DPB.25D*76) .....

400. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-2 (DPB.25D*76) .....

401. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-1 (DPB.75D*79) .....

402. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-1 (DPB.50D*79) .....

403. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-1 (DPB.25D*79) .....

404. Differential pressure in broken loop cold leg, pitot tube rake, Test S-IB-2 (DPB.25D*79) .....

Microfiche sheet 002

405. Differential pressure in vessel downcomer, Test S-IB-1 (DVD + 29 + 421) .....

406. Differential pressure in vessel downcomer, Test S-IB-2 (DVD + 29 + 421) .....

407. Liquid level in vessel downcomer, Test S-IB-1 (LVD + 29-578) .....

408. Liquid level in vessel downcomer, Test S-IB-2 (LVD + 29-578) .....

409. Liquid level in vessel downcomer, Test S-IB-1 (LVD + 29-170) .....

410. Liquid level in vessel downcomer, Test S-IB-2 (LVD + 29-170) .....

411. Liquid level in vessel downcomer, Test S-IB-1 (LVD170-435) .....

412. Liquid level in vessel downcomer, Test S-IB-2 (LVD170-435) .....

413. Liquid level in vessel downcomer, Test S-IB-2 (LVD435-578) .....

414. Liquid level in vessel, Test S-IB-1 (LV + 421-578) .....

415. Liquid level in vessel, Test S-IB-2 (LV + 421-578) .....

416. Liquid level in vessel, Test S-IB-1 (LV + 421-13M) .....

417. Liquid level in vessel, Test S-IB-2 (LV + 421-13M) .....

418. Liquid level in vessel, Test S-IB-1 (LV + 421 + 160) .....

419. Liquid level in vessel, Test S-IB-2 (LV + 421 + 160) .....

420. Liquid level in vessel, Test S-IB-1 (DV + 160 + 135) .....

421. Liquid level in vessel, Test S-IB-2 (DV + 160 + 135) .....

422. Liquid level in vessel, Test S-IB-1 (LV + 135-13M) .....

423. Liquid level in vessel, Test S-IB-2 (LV + 135-13M) .....

424. Liquid level in vessel, Test S-IB-1 (LV-13M-578) .....

425. Liquid level in vessel, Test S-IB-2 (LV-13M-578) .....

426. Liquid level in vessel, Test S-IB-1 (LV-13M-105) .....

427. Liquid level in vessel, Test S-IB-2 (LV-13M-105) .....

428. Liquid level in vessel, Test S-IB-1 (LV-105-195) .....

429. Liquid level in vessel, Test S-IB-2 (LV-105-195) .....

430. Liquid level in vessel, Test S-IB-1 (LV-195-278) .....

431. Liquid level in vessel, Test S-IB-2 (LV-195-278) .....

Microfiche sheet 002

432. Liquid level in vessel, Test S-IB-1 (LV-278-360) .....

433. Liquid level in vessel, Test S-IB-2 (LV-278-360) .....

434. Liquid level in vessel, Test S-IB-1 (LV-360-442) .....

435. Liquid level in vessel, Test S-IB-2 (LV-360-442) .....

436. Liquid level in vessel, Test S-IB-1 (LV-442-501) .....

437. Liquid level in vessel, Test S-IB-2 (LV-442-501) .....

438. Liquid level in vessel, Test S-IB-1 (LV-501-578) .....

439. Liquid level in vessel, Test S-IB-2 (LV-501-578) .....

440. Liquid level, intact loop steam generator primary side, Test S-IB-1 (LIP970-55E) .....

441. Liquid level, intact loop steam generator primary side, Test S-IB-2 (LIP970-55E) .....

442. Liquid level, intact loop steam generator secondary side, Test S-IB-1 (LIS1117 + 50) .....

443. Liquid level, intact loop steam generator secondary side, Test S-IB-1 (LIS1117 + 50) .....

444. Differential pressure across intact loop steam generator feedwater flow orifice, Test S-IB-1 (DPSC*IGFDW) .....

445. Differential pressure across intact loop steam generator feedwater flow orifice, Test S-IB-2 (DPSC*IGFDW) .....

446. Differential pressure across intact loop steam generator steam flow orifice, Test S-IB-1 (DPSC*IGSTM) .....

447. Differential pressure across intact loop steam generator steam flow orifice, Test S-IB-2 (DPSC*IGSTM) .....

448. Liquid level, broken loop steam generator secondary side, Test S-IB-1 (LBS1117 + 50) .....

449. Liquid level, broken loop steam generator secondary side, Test S-IB-2 (LBS1117 + 50) .....

450. Differential pressure across broken loop steam generator feedwater flow orifice, Test S-IB-1 (DPSC*BGFDW) .....

451. Differential pressure across broken loop steam generator feedwater flow orifice, Test S-IB-2 (DPSC*BGFDW) .....

452. Differential pressure across broken loop steam generator steam flow orifice, Test S-IB-1 (DPSC*BGSTM) .....

453. Differential pressure across broken loop steam generator steam flow orifice, Test S-IB-2 (DPSC*BGSTM) .....

Microfiche sheet 002

454. Liquid level in accumulator for intact loop, Test S-IB-1 (LCI*A3+277) .....

455. Liquid level in accumulator for intact loop, Test S-IB-2 (LCI*A3+277) .....

456. Liquid level, intact loop HPIS supply water tank, Test S-IB-1 (LCI*T7+277) .....

457. Liquid level, intact loop HPIS supply water tank, Test S-IB-2 (LCI*T7+277) .....

458. Differential pressure in pressurizer, Test S-IB-1 (DP*PRZ*13C) .....

459. Differential pressure in pressurizer, Test S-IB-2 (DP*PRZ*13C) .....

460. Liquid level in pressurizer, Test S-IB-1 (LPRZ146+25) .....

461. Liquid level in pressurizer, Test S-IB-2 (LPRZ146+25) .....

462. Liquid level in pressure suppression tank, Test S-IB-1 (LPS+384+0) .....

463. Liquid level in pressure suppression tank, Test S-IB-2 (LPS+105+48) .....

464. Liquid level in feedwater tank, Test S-IB-1 (LSCT488+97) .....

465. Volumetric flow rate in intact loop hot leg, Test S-IB-1 (QI*1) .....

466. Volumetric flow rate in intact loop hot leg, Test S-IB-2 (QI*1) .....

467. Volumetric flow rate in intact loop hot leg, Test S-IB-1 (QI*6) .....

468. Volumetric flow rate in intact loop hot leg, Test S-IB-2 (QI*6) .....

469. Volumetric flow rate in intact loop hot leg, Test S-IB-1 (QI*15) .....

470. Volumetric flow rate in intact loop hot leg, Test S-IB-2 (QI*15) .....

471. Volumetric flow rate in intact loop cold leg, Test S-IB-1 (QI*21) .....

472. Volumetric flow rate in intact loop cold leg, Test S-IB-2 (QI*21) .....

473. Volumetric flow rate in intact loop cold leg, Test S-IB-1 (QI*22) .....

474. Volumetric flow rate in intact loop cold leg, Test S-IB-2 (QI*22) .....

475. Volumetric flow rate in broken loop hot leg, Test S-IB-1 (QB*50) .....

476. Volumetric flow rate in broken loop hot leg, Test S-IB-2 (QB*50) .....

477. Volumetric flow rate in broken loop hot leg, Test S-IB-1 (QB*57) .....

478. Volumetric flow rate in broken loop hot leg, Test S-IB-2 (QB*57) .....

479. Volumetric flow rate in broken loop cold leg, Test S-IB-1 (QB*73) .....

Microfiche sheet 002

480. Volumetric flow rate in broken loop cold leg, Test S-IB-2 (QB*73) .....

481. Volumetric flow rate in broken loop cold leg, Test S-IB-1 (QB*74) .....

482. Volumetric flow rate in broken loop cold leg, Test S-IB-2 (QB*74) .....

483. Volumetric flow rate in broken loop cold leg, Test S-IB-1 (QB*79) .....

484. Volumetric flow rate in broken loop cold leg, Test S-IB-2 (QB*79) .....

485. Volumetric flow rate in vessel downcomer, Test S-IB-1 (QV*DC-423) .....

486. Volumetric flow rate in vessel downcomer, Test S-IB-2 (QV*DC-423) .....

487. Volumetric flow rate in vessel upper plenum, Test S-IB-1 (QV*UP + 1) .....

488. Volumetric flow rate in vessel upper plenum, Test S-IB-2 (QV*UP + 1) .....

489. Volumetric flow rate in vessel guide tube, Test S-IB-1 (QV*GT + 321) .....

490. Volumetric flow rate in vessel guide tube, Test S-IB-2 (QV*GT + 321) .....

491. Volumetric flow rate in vessel upper head bypass line, Test S-IB-1 (QV*BYPASS) .....

492. Volumetric flow rate from intact loop coolant injection accumulator, Test S-IB-1 (QCI*A3) .....

493. Volumetric flow rate from intact loop coolant injection accumulator, Test S-IB-2 (QCI*A3) .....

494. Volumetric flow rate from intact loop low pressure injection system, Test S-IB-2 (QCI*ILLPIS) .....

495. Volumetric flow rate at pressurizer exit, Test S-IB-1 (Q*PRZ-30) .....

496. Volumetric flow rate at pressurizer exit, Test S-IB-2 (Q*PRZ-30) .....

497. Momentum flux in intact loop hot leg, Test S-IB-1 (FI*1) .....

498. Momentum flux in intact loop hot leg, Test S-IB-2 (FI*1) .....

499. Momentum flux in intact loop hot leg, Test S-IB-1 (FI*5) .....

500. Momentum flux in intact loop cold leg, Test S-IB-2 (FI*9) .....

501. Momentum flux in intact loop cold leg, Test S-IB-1 (FI*15) .....

502. Momentum flux in intact loop cold leg, Test S-IB-2 (FI*15) .....

503. Momentum flux in intact loop cold leg, Test S-IB-1 (FI*22) .....

504. Momentum flux in intact loop cold leg, Test S-IB-2 (FI*22) .....

Microfiche sheet 002

505. Momentum flux in broken loop hot leg, Test S-IB-1 (FB*50) .....

506. Momentum flux in broken loop hot leg, Test S-IB-2 (FB*50) .....

507. Momentum flux in broken loop hot leg, Test S-IB-1 (FB*57) .....

508. Momentum flux in broken loop hot leg, Test S-IB-2 (FB*57) .....

509. Momentum flux in broken loop cold leg, Test S-IB-1 (FB*62) .....

510. Momentum flux in broken loop cold leg, Test S-IB-2 (FB*62) .....

511. Momentum flux in broken loop cold leg, Test S-IB-1 (FB*74) .....

512. Momentum flux in broken loop cold leg, Test S-IB-2 (FB*74) .....

513. Momentum flux in broken loop cold leg, Test S-IB-1 (FB*76) .....

514. Momentum flux in broken loop cold leg, Test S-IB-2 (FB*76) .....

515. Momentum flux in broken loop cold leg, Test S-IB-1 (FB*79) .....

516. Momentum flux in broken loop cold leg, Test S-IB-2 (FB*79) .....

517. Momentum flux in vessel downcomer, Test S-IB-1 (FV*DC-441) .....

518. Momentum flux in vessel downcomer, Test S-IB-2 (FV*DC-441) .....

519. Momentum flux in vessel upper plenum, Test S-IB-1 (FV*UP-9) .....

520. Momentum flux in vessel upper plenum, Test S-IB-2 (FV*UP-9) .....

521. Momentum flux in vessel guide tube, Test S-IB-1 (FV*GT + 330) .....

522. Momentum flux in vessel guide tube, Test S-IB-2 (FV*GT + 330) .....

523. Density in intact loop hot leg, Test S-IB-1 (RI*1T) .....

524. Density in intact loop hot leg, Test S-IB-2 (RI*1T) .....

525. Density in intact loop hot leg, Test S-IB-1 (RI*1B) .....

526. Density in intact loop hot leg, Test S-IB-2 (RI*1B) .....

527. Density in intact loop hot leg, Test S-IB-1 (RI*5M) .....

528. Density in intact loop hot leg, Test S-IB-2 (RI*5M) .....

529. Density in intact loop cold leg, Test S-IB-1 (RI*9M) .....

530. Density in intact loop cold leg, Test S-IB-2 (RI*9M) .....

Microfiche sheet 002

531. Density in intact loop cold leg, Test S-IB-1 (RI*21T) .....
532. Density in intact loop cold leg, Test S-IB-2 (RI*21T) .....
533. Density in intact loop cold leg, Test S-IB-1 (RI*21B) .....
534. Density in intact loop cold leg, Test S-IB-2 (RI*21B) .....
535. Density in intact loop cold leg, Test S-IB-1 (RI*22T) .....
536. Density in intact loop cold leg, Test S-IB-1 (RI*22B) .....
537. Density in broken loop hot leg, Test S-IB-1 (RB*50T) .....
538. Density in broken loop hot leg, Test S-IB-2 (RB*50T) .....
539. Density in broken loop hot leg, Test S-IB-2 (RB*50M) .....
540. Density in broken loop hot leg, Test S-IB-2 (RB*57M) .....
541. Density in broken loop cold leg, Test S-IB-1 (RB*62M) .....
542. Density in broken loop cold leg, Test S-IB-2 (RB*62M) .....
543. Density in broken loop cold leg, Test S-IB-1 (RB*73) .....
544. Density in broken loop cold leg, Test S-IB-2 (RB*73) .....
545. Density in broken loop cold leg, Test S-IB-1 (RB*74T) .....
546. Density in broken loop cold leg, Test S-IB-2 (RB*74T) .....
547. Density in broken loop cold leg, Test S-IB-1 (RB*74M) .....
548. Density in broken loop cold leg, Test S-IB-2 (RB*74M) .....
549. Density in broken loop cold leg, Test S-IB-1 (RB*76T) .....
550. Density in broken loop cold leg, Test S-IB-2 (RB*76T) .....

Microfiche sheet 003

551. Density in broken loop cold leg, Test S-IB-1 (RB*76M) .....
552. Density in broken loop cold leg, Test S-IB-2 (RB*76M) .....
553. Density in broken loop cold leg, Test S-IB-1 (RB*79T) .....
554. Density in broken loop cold leg, Test S-IB-2 (RB*79T) .....
555. Density in broken loop cold leg, Test S-IB-1 (RB*79M) .....

Microfiche sheet 003

556. Density in broken loop cold leg, Test S-IB-2 (RB*79M) .....

557. Density in vessel downcomer, Test S-IB-1 (RV*DC-72) .....

558. Density in vessel downcomer, Test S-IB-2 (RV*DC-72) .....

559. Density in vessel downcomer, Test S-IB-1 (RV*DC-260) .....

560. Density in vessel downcomer, Test S-IB-2 (RV*DC-260) .....

561. Density in vessel downcomer, Test S-IB-1 (RV*DC-456) .....

562. Density in vessel downcomer, Test S-IB-2 (RV*DC-456) .....

563. Density in vessel, Test S-IB-1 (RV*AB-6) .....

564. Density in vessel, Test S-IB-2 (RV*AB-6) .....

565. Density in vessel, Test S-IB-1 (RV*23+13) .....

566. Density in vessel, Test S-IB-2 (RV*23+13) .....

567. Density in vessel, Test S-IB-1 (RV*23+113) .....

568. Density in vessel, Test S-IB-2 (RV*23+113) .....

569. Density in vessel, Test S-IB-1 (RV*AB+173) .....

570. Density in vessel, Test S-IB-2 (RV*AB+173) .....

571. Density in vessel, Test S-IB-1 (RV*23+183) .....

572. Density in vessel, Test S-IB-2 (RV*23+183) .....

573. Density in vessel, Test S-IB-1 (RV*23+253) .....

574. Density in vessel, Test S-IB-2 (RV*23+253) .....

575. Density in vessel, Test S-IB-1 (RV*23+342) .....

576. Density in vessel upper plenum, Test S-IB-1 (RV*UP-11) .....

577. Density in vessel upper plenum, Test S-IB-2 (RV*UP-11) .....

578. Density in vessel upper head, Test S-IB-1 (RV*UH+339) .....

579. Density in vessel upper head, Test S-IB-2 (RV*UH+339) .....

580. Density in vessel upper head, Test S-IB-1 (RV*UH+173) .....

581. Density in vessel upper head, Test S-IB-2 (RV*UH+173) .....

Microfiche sheet 003

582. Core heater high power bus current, Test S-IB-1 (IV*HIPWBUS) .....

583. Core heater high power bus current, Test S-IB-2 (IV*HIPWBUS) .....

584. Core heater high power bus voltage, Test S-IB-1 (EV*HIPWBUS) .....

585. Core heater high power bus voltage, Test S-IB-2 (EV*HIPWBUS) .....

586. Core heater low power bus current, Test S-IB-1 (IV*LOPWBUS) .....

587. Core heater low power bus current, Test S-IB-2 (IV*LOPWBUS) .....

588. Core heater low power bus voltage, Test S-IB-1 (EV*LOPWBUS) .....

589. Core heater low power bus voltage, Test S-IB-2 (EV*LOPWBUS) .....

590. Power for high power bus, Test S-IB-1 (KWH*HIC) .....

591. Power for high power bus, Test S-IB-2 (KWH*HIC) .....

592. Power for low power bus, Test S-IB-1 (KWH*LOC) .....

593. Power for low power bus, Test S-IB-2 (KWH*LOC) .....

594. Total power to core, Test S-IB-1 (KWH*TOTC) .....

595. Total power to core, Test S-IB-2 (KWH*TOTC) .....

596. Intact loop pump current, Test S-IB-1 (II*PUMP) .....

597. Intact loop pump current, Test S-IB-2 (II*PUMP) .....

598. Intact loop pump voltage, Test S-IB-1 (EI*PUMP) .....

599. Intact loop pump voltage, Test S-IB-2 (EI*PUMP) .....

600. Intact loop pump speed, Test S-IB-1 (WI*PUMP) .....

601. Intact loop pump speed, Test S-IB-2 (WI*PUMP) .....

602. Broken loop pump power, Test S-IB-1 (KWB*PUMP) .....

603. Broken loop pump power, Test S-IB-2 (KWB*PUMP) .....

604. Broken loop pump speed, Test S-IB-1 (WB*PUMP) .....

605. Broken loop pump speed, Test S-IB-2 (WB*PUMP) .....

606. Intact loop feedwater valve position, Test S-IB-1 (XSC*IGFDW) .....

607. Intact loop feedwater valve position, Test S-IB-2 (XSC*IGFDW) .....

[redacted]

Microfiche sheet 003

608. Broken loop feedwater valve position, Test S-IB-1 (XSC*BGFDW) .....
609. Broken loop feedwater valve position, Test S-IB-2 (XSC*BGFDW) .....
610. Intact loop steam valve position, Test S-IB-1 (XSC*IGSTM) .....
611. Intact loop steam valve position, Test S-IB-2 (XSC*IGSTM) .....
612. Broken loop steam valve position, Test S-IB-1 (XSC*BGSTM) .....
613. Broken loop steam valve position, Test S-IB-2 (XSC*BGSTM) .....

TABLES

1. Conditions at blowdown initiation 4
2. Primary coolant temperature distribution before rupture 5
3. Sequence of events 6
4. Data presentation for Semiscale Mod-2A, Tests S-IB-1 and S-IB-2 8

EXPERIMENT DATA REPORT FOR SEMISCALE MOD-2A INTERMEDIATE BREAK TEST SERIES (TESTS S-IB-1 AND S-IB-2)

1. INTRODUCTION

The Semiscale Mod-2A experiments represent the current phase of the Semiscale Program conducted by EG&G Idaho, Inc., for the United States Government. The program, sponsored by the Nuclear Regulatory Commission (NRC) through the Department of Energy (DOE), is part of the overall NRC water reactor research program to investigate the response of a pressurized water reactor (PWR) system to hypothesized loss-of-coolant accidents (LOCAs). The underlying objectives of the Semiscale Program are to quantify the physical processes that control system behavior during operational transients or a LOCA, and to provide an experimental data base for assessing reactor safety evaluation models. The Semiscale Mod-2A Program has the further objective of providing support to other experimental programs in the forms of instrumentation assessment, test series optimization, selection of test parameters, and comparative evaluation of test results.

Tests S-IB-1 and S-IB-2 were conducted on January 14 and February 10, 1982, respectively, in the Semiscale Mod-2A system, as part of the Mod-2A Intermediate Break Test Series (Test Series IB). This series investigates the thermal-hydraulic phenomena resulting from LOCAs in a PWR system and provides experimental data which can be used to assess and develop computer codes that predict PWR system behavior during a LOCA.

The primary objective of these tests was to expand the break data base to cover the 10% to 200% range. Tests S-IB-1 and S-IB-2 were communicative in nature and incorporated 100% and 50% break orifices, respectively.

This report presents the test data in an uninterpreted but readily usable form for use by the nuclear community in advance of detailed analysis and interpretation. Section 3 presents the data graphs, comments, and supporting information necessary for interpretation of the data. A description of the overall Semiscale Program and test series, and a more detailed description of the Intermediate Break Test Series, are contained in References 1 and 2. Preliminary analysis and interpretation of Test S-IB-1 and S-IB-2 data are presented in References 3 and 4. Data acquisition system capabilities, posttest adjustments made to the data, and the methodology used to establish uncertainty limits for the data are described in Reference 5.

2. SYSTEM, PROCEDURES, CONDITIONS, AND EVENTS FOR TESTS S-IB-1 AND S-IB-2

The following system configuration, procedures, conditions, and events are specific to Tests S-IB-1 and S-IB-2.

System Configuration

The Semiscale Mod-2A system used for these tests consists of a pressure vessel with simulated reactor internals, including a 25-rod core with electrically powered rods and an external downcomer assembly; an intact loop with pressurizer, steam generator, and pump; and a broken loop with a steam generator, pump, and rupture disc assembly. The system also has emergency core cooling (ECC) for the intact loop from high- and low-pressure injection pumps, a coolant injection accumulator for the intact loop, and a pressure suppression system with steam supply and pressure suppression tank.

Twenty-three rods of the 25-rod core were powered equally with a power density of 35.91 kW/m. Total core power for Tests S-IB-1 and S-IB-2 was 2.01 and 1.97 MW, respectively.

Test Preparation

In preparation for the two tests, the system was filled with treated demineralized water and vented at strategic points to ensure a liquid-full condition. Treated demineralized water in the steam generator feedwater tank was heated to 528 K, and the required liquid levels were established in the steam generator secondary sides. Before warmup, the system was checked for leakage, and system instrumentation was checked for proper operation.

Warmup

Warmup to initial test conditions was accomplished using the core heaters. During warmup, the purification and sampling systems were valved into the primary system to maintain water chemistry requirements and to provide a water sample at system conditions for subsequent analysis. Also during warmup, detector readings were sampled at 50 K temperature intervals to check measurement instrumentation integrity and data acquisition system performance.

Test Sequence

For both tests, the intact-loop accumulator was filled with treated demineralized water, drained to specified levels, and pressurized with nitrogen to 4.2 MPa. Prior to initial core power level being established, the pressure suppression system was pressurized to 0.24 MPa with saturated steam from the steam supply system. After core power was increased to a nominal 2.0 MW, initial test conditions were achieved and held for approximately 485 s and 405 s for Tests S-IB-1 and S-IB-2, respectively, to establish system equilibrium. All auxiliary systems were then isolated to prevent blowdown through these systems. A simulated intermediate cold-leg break was accomplished using a rupture disc and blowdown nozzle having a total break area of 2.24 cm^2 for Test S-IB-1 and 1.13 cm^2 for Test S-IB-2. Pressure to operate the rupture assembly and initiate blowdown was taken from an accumulator system filled with water and pressurized to 15.6 MPa with gaseous nitrogen. Immediately (within 0.02 s) after rupture initiation the lines to the accumulator were again isolated. The effluent was ejected from the primary system to the pressure suppression system, which was vented to maintain a constant pressure of 0.241 MPa. At blowdown, power to the intact-loop primary circulation pump was reduced; the pump was allowed to coast down to approximately 50% of initial speed and was maintained there for the duration of the test. Broken-loop primary circulation pump initial speed at rupture was increased by 50%, maintained for 22 s, decreased to 30% of initial value, and maintained there until $t = 51$ s for Test S-IB-1 and $t = 101$ s for Test S-IB-2, at which time power was tripped and the pump was allowed to coast down. During the blowdown transient, power to the electrically heated core was automatically controlled to simulate the thermal decay response of nuclear fuel rods.

The coolant injection systems were arranged to discharge into the intact-loop cold leg for both tests. Only the high-pressure coolant injection

pumps were used. The low-pressure flow rate was simply added to the high-pressure rate for pressures below 0.88 MPa. The high-pressure injection pumps were not used for Test S-IB-2, but the low-pressure injection pump was started at the required system pressure of 0.88 MPa and continued for the duration of the test.

Coolant injection accumulators operated automatically in response to system pressure during both tests. Injection began approximately 30 s and 50 s after blowdown initiation during S-IB-1 and S-IB-2, respectively.

Tabular Data for Test Conditions

Tables 1 and 2 show conditions in the Semiscale Mod-2A system at initiation of blowdown. Table 3 lists the sequence of events relative to rupture.

BEST DOCUMENT AVAILABLE

Table 1. Conditions at blowdown initiation

	Measured[a]		Specified
	Test S-IB-1	Test S-IB-2	Test S-IB-1 and Test S-IB-2
Core power (MW)	2.017	1.957	1.95 ± 0.05
System pressure (MPa)	15.81	15.51	15.50 ± 0.20
Intact loop cold leg fluid temperature (K)1	556	555	557 ± 2
Broken loop cold leg fluid temperature (K)	562	560	557 ± 2
Intact loop hot leg to cold leg temperature differential (K)	40	40	37 ± 2
Broken loop hot leg to cold leg temperature differential (K)	23	26	37 ± 2
Intact loop cold leg flow (L/s)	10.21	10.02	--[b]
Broken loop cold leg flow (L/s)	3.47	3.43	--[b]
Steam generator feedwater temperature[c] (K)	495	528	495 ± 2
Intact loop steam generator liquid level (cm above top of tube sheet)	658.3	693.4	--[d]
Broken loop steam generator liquid level (cm above top of tube sheet)	598.6	701.9	--[d]

a. Measured initial conditions are taken from digital acquisition system reading prior to blowdown initiation.

b. Flow is not specified since it must be adjusted to achieve the required differential temperature across the core.

c. One source of feedwater for intact and broken loops.

d. Maximum level for stable operation.

BEST DOCUMENT AVAILABLE

Table 2. Primary coolant temperature distribution before rupture[a]

		Temperature (K)	
	Detector	Test S-IB-1	Test S-IB-2
Intact loop hot leg (near vessel)	TFI*1	593	591
Intact loop cold leg	TFI*15	556	555
Intact loop cold leg (near downcomer)	TFI*22	553	551
Broken loop hot leg (near vessel)	TFB*50	585	586
Broken loop cold leg (near downcomer)	TFB*79	562	560
Vessel downcomer (near top)	TFV*DC-84	558	555
Vessel downcomer (middle)	TFV*DC-270	560	558
Vessel downcomer (near bottom)	TFD*DC-436	555	554
Core (top of heated length)	TFV*A4+361	596	597
Core (middle of heated length)	TFV*B3+162	581	579
Core (bottom of heated length)	TFV*B3+45	567	563
Vessel lower plenum	TFV*LP-552	557	556

a. Average of data taken from -20 s to -3.0 s before blowdown initiation.

BEST DOCUMENT AVAILABLE

Table 3. Sequence of events

Event	Time Relative to Rupture (s)	
	Test S-IB-1	Test S-IR-2
Core power level established	-485 s	-405 s
Makeup pump and pressurizer heaters off	-2.5 s	-2.5 s
Core power decay transient started	0.6 s	0
Intact and broken loop pump control initiated	0 s	0 s
Intact and broken loop steam generator discharge valves closed	4 s	5 s
Intact and broken loop steam generator feedwater valves closed	21 s	11 s
High pressure injection system flow started	30 s	30 s
Intact loop pump powr terminated	485+s	1012+s
Broken loop pump power terminated	51 s	108 s
Intact loop accumulator flow started	27 s	11 s
Core power terminated	483+s	1012+s

a. A time-controlled sequencer was used to control critical events during the test.

3. DATA PRESENTATION

This section presents the data from Semiscale Mod-2A Tests S-IB-1 and S-IB-2 with brief comment. Processing analysis serves only to obtain appropriate engineering units and to ensure that data are reasonable and consistent. In all cases, analysts assumed a homogeneous fluid when converting transducer output to engineering units; however, further interpretation and analysis should take into consideration the possibility that sudden decompression processes, such as those occurring during blowdown, may have subjected measurement devices to nonhomogeneous fluid conditions.

System performance during Tests S-IB-1 and S-IB-2 was monitored by 301 and 306 detectors, respectively. A digital data acquisition system recorded data at an effective sample rate of 40 and 20 points per second per channel.

The data appear, in some instances, in the form of composite graphs to facilitate comparison of the values of given variables. The scales selected for the graphs do not reflect the obtainable resolution of the data. (References 1 and 5 describe the data processing techniques further.)

Table 4 groups the measurements according to type, identifies the location and range of the detectors and actual recording range of the data acquisition system, provides brief comments regarding the data, and references the detector and comments to the corresponding figure.

Figures 1 through 12 present information for interpreting the data graphs. Figures 13 through 613 (data graphs) present the blowdown data obtained. Time zero on the graphs is the time of rupture initiation. Reference 4 provides information explaining the data acquisition system capabilities and a guide to the uncertainty associated with data measurements in the Semiscale Mod-2A system.

Figures 13 through 613 are on microfiche attached to the inside of the back cover.

BEST DOCUMENT AVAILABLE

Table 4. Data presentation for Semiscale Mod-2A Tests S-IB-1 and S-IB-2

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
FLUID TEMPERATURE	Chromel-Alumel thermocouples unless specified otherwise.				
Intact Loop		0 to 1533 K	0 to 820 K		
TFI*1	Hot leg, Spool 1, 50 cm from vessel center.			13, 14	
TFI*5	Hot leg, Spool 5, 363 cm from vessel center.			15, 16	
TFI*9	Cold leg, Spool 9, 1017 cm from downcomer center.			17, 18	
TFI*15	Cold leg, Spool 15, 642 cm from downcomer center.			19, 20	
TFI*17	Cold leg, Spool 17, 338 cm from downcomer center.			21, 22	
TFI*21	Cold leg, Spool 21, 138 cm from downcomer center.			23, 24	
TFI*22	Cold leg, Spool 22, 48 cm from downcomer center.			25, 26	
Broken Loop					
TFB*50	Hot leg, Spool 50, 73 cm from vessel center.			27, 28	
TFB*57	Hot leg, Spool 57, 278 cm from vessel center.			29, 30	
TFB*62	Cold leg, Spool 62, 962 cm from downcomer center.			31, 32	
TFB*64	Cold leg, Spool 64, 638 cm from downcomer center.			33	S-IB-2 only
TFB*73	Cold leg, Spool 73, 337 cm from downcomer center.			34, 35	
TFB*74	Cold leg, Spool 74, 220 cm from downcomer center.			36, 37	
TFB*76U	Cold leg, Spool 76 tap U, 150 cm from downcomer center.			38, 39	
TFB*76	Cold leg, Spool 76, tap A, 6 cm upstream of rupture disc assembly 191 cm from downcomer center.			40, 41	
TFB*79	Cold leg, Spool 79, 78 cm from downcomer center.			42, 43	
Vessel					
Vessel Downcomer		0 to 1533 K	0 to 820 K		
TFV*DC-84	Downcomer extension, 84 cm below cold leg centerline.			44, 45	
TFV*DC-270	Downcomer extension, 270 cm below cold leg centerline.			46, 47	
TFV*DC-436	Downcomer extension, 436 cm below cold leg centerline.			48, 49	
Vessel Lower Plenum		0 to 1533 K	0 to 820 K		
TFV*LP-552	In vessel lower plenum 552 cm below cold leg centerline.			50, 51	
Vessel Upper Plenum		0 to 1533 K	0 to 820 K		
TFV*UP-63	In vessel upper plenum, 63 cm below cold leg centerline.			52, 53	
TFV*UPM-13	In vessel upper plenum, 13 cm below cold leg centerline at 180°.			54, 55	
TFV*UP+79	In vessel upper plenum, 79 cm above cold leg centerline.			56, 57	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
FLUID TEMPERATURE (continued)					
Vessel Upper Head					
TFV*UH01R0	In vessel upper head, 180 cm above cold leg centerline at 225°.			58, 59	
TFV*UH02R2	In vessel upper head, 282 cm above cold leg centerline at 225°.			60, 61	
TFV*UH*343	In vessel upper head, 343 cm above cold leg centerline.			62, 63	Trend information only
TFV*UH*402	In vessel upper head, 402 cm above cold leg centerline.			64, 65	
TFV*BYPASS	In bypass line connecting upper plenum to downcomer.			66, 67	
Core Grid Spacers		0 to 1533 K	0 to 1500 K		
Grid Spacer 2	450 cm below cold leg centerline, 46 cm above bottom of heated length.				
TFV*B3*46	Thermocouple in space defined by Columns B and C, Rows 3 and 4.			68	S-IB-2 only
Grid Spacer 3	410 cm below cold leg centerline, 86 cm above bottom of heated length.				
TFV*A4*86	Thermocouple in space defined by Columns A and B, Rows 4 and 5.			69, 70	
Grid Spacer 4	370 cm below cold leg centerline, 126 cm above bottom of heated length.				
TFV*B3*126	Thermocouples in space defined by Columns B and C, Rows 3 and 4.			71, 72	
TFV*D1*126	Thermocouple in space defined by Columns D and E, Rows 1 and 2.			73	S-IB-2 only
Grid Spacer 5	330 cm below cold leg centerline, 166 cm above bottom of heated length.				
TFV*A4*166	Thermocouple in space defined by Columns A and B, Rows 1 and 2.			74	S-IB-2 only
TFV*B3*166	Thermocouple in space defined by Columns B and C, Rows 3 and 4.			75, 76	
TFV*D1*166	Thermocouple in space defined by Columns D and E, Rows 1 and 2.			77, 78	
Grid Spacer 7	250 cm below cold leg centerline, 246 cm above bottom of heated length.				
TFV*A4*246	Thermocouple in space defined by Columns A and B, Rows 4 and 5.			79, 80	
TFV*B3*246	Thermocouple in space defined by Columns B and C, Rows 3 and 4.			81, 82	
Grid Spacer 8	210 cm below cold leg centerline, 286 cm above bottom of heated length.				
TFV*A4*286	Thermocouple in space defined by Columns A and B, Rows 4 and 5.			83, 84	
Grid Spacer 9	170 cm below cold leg centerline, 326 cm above bottom of heated length.				
TFV*A4*326	Thermocouple in space defined by Columns A and B, Rows 4 and 5.			85, 86	
TFV*B3*326	Thermocouple in space defined by Columns B and C, Rows 3 and 4.			87, 88	
TFV*D1*326	Thermocouple in space defined by Columns D and E, Rows 1 and 2.			89, 90	
Grid Space 10	130 cm below cold leg centerline, 366 cm above bottom of heated length.				
TFV*A4*366	Thermocouple in space defined by Columns A and B, Rows 4 and 5.			91, 92	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
FLUID TEMPERATURE (continued)					
Steam Generator		0 to 1533 K	0 to 820 K		
Intact Loop, Primary Side					
TFIP+LH30	In long tube, hot (inlet) side, 30 cm above top of tube sheet.			93, 94	
TFIP+LH452	In long tube, hot (inlet) side, 452 cm above top of tube sheet.			95, 96	
TFIP+LH922	In long tube, hot (inlet) side, 922 cm above top of tube sheet.			97, 98	
TFIP+LC211	In long tube, cold (outlet) side, 211 cm above top of tube sheet.			99, 100	
Broken Loop, Primary Side		0 to 1533 K	0 to 820 K		
TFBP+LH211	In long tube, hot (inlet) side, 211 cm above top of tube sheet.			101, 102	
TFBP+LH452	In long tube, hot (inlet) side, 452 cm above top of tube sheet.			103, 104	
TFBP+LH668	In long tube, hot (inlet) side, 668 cm above top of tube sheet.			105, 106	
TFBP+LH922	In long tube, hot (inlet) side, 922 cm above top of tube sheet.			107, 108	
Intact Loop, Secondary Side		0 to 1533 K	0 to 820 K		
TFSC*IGFDW	Feedwater temperature at flow orifice.			109, 110	
TFSC*IGFWL	Feedwater temperature at lower injection port.			111, 112	
TFIS*D+152	In downcomer, 152 cm above top of tube sheet.			113	S-IB-1 only
TFIS+LH30	On long tube, hot (inlet) side, 30 cm above top of tube sheet.			114, 115	
TFIS+LC211	On long tube, cold (outlet) side, 211 cm from top of tube sheet.			116, 117	
TFIS+LH452	On long tube, hot (inlet) side, 452 cm above top of tube sheet.			118, 119	
TFIS+LH922	On long tube, hot (inlet) side, 922 cm above top fo tube sheet.			120, 121	
TFIS+1117	In steam dome, 1117 cm above top of tube sheet.			122, 123	
TFSC*IGSTM	Steam exit temperature at flow venturi.			124, 125	
Broken Loop, Secondary Side		0 to 1533 K	0 to 820 K		
TFSC*BGFDW	Feedwater temperature at flow orifice.			126, 127	
TFSC*BGFWL	Feedwater temperature at lower injection port.			128, 129	
TFBS*D+152	In downcomer, 152 cm above top of tube sheet.			130	S-IB-1 only
TFBS*D+457	In downcomer, 457 cm above top of tube sheet.			131	S-IB-1 only
TFBS+LH211	On long tube, hot (inlet) side, 211 cm above top of tube sheet.			132, 133	
TFBS+LH452	On long tube, hot (inlet) side, 452 cm above top of tube sheet.			134, 135	
TFBS+LH668	On long tube, hot (inlet) side, 668 cm above top of tube sheet.			136, 137	
TFBS+LH922	On long tube, hot (inlet) side, 922 cm above top of tube sheet.			138, 139	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	System	Figure[a]	Measurement Comments[b]
FLUID TEMPERATURE (continued)					
Broken Loop, Secondary Side (continued)					
TFBS*1117	In steam dome 1117 cm above top of tube sheet.			140, 141	
TFSC*BCSTH	Steam exit temperature at flow venturi.			142, 143	
Pressurizer		0 to 1533 K	0 to 820 K		
TF*PRZ*132	In top of pressurizer, 132 cm above exit to surge line.			144, 145	
TF*PRZ-73	In surge line, 73 cm below pressurizer exit.			146, 147	
TF*PRZ*13	In surge line at entrance to intact loop Spool 3.			148, 149	
Coolant Injection ECC System		0 to 1533 K	0 to 820 K		
TFCI*122	In ECC line at intact loop Spool 22.			150, 151	
TFCI*A3+76	In accumulator for intact loop.			152, 153	
TFCI*T7+0	In HPIS supply tank.			154	S-IB-2 only
Pressure Suppression System					
TFPS*1T+43	Temperature in pressure suppression tank, 43 cm above bottom of tank.			155, 156	
TFPS*1T330	Temperature in pressure suppression tank, 330 cm above bottom of tank.			157, 158	
METAL TEMPERATURE	Chromel-Alumel thermocouples unless specified otherwise.				
MATERIAL TEMPERATURE					
Vessel					
TMV*FPF221	In vessel on upper head filler piece, 221 cm above cold leg centerline at 75°.			159, 160	
TMV*FPD+79	In vessel on upper plenum filler piece, 79 cm above cold leg centerline at 45°.			161, 162	
TMV*TSQ221	In vessel on thermo shield, 221 cm above cold leg centerline at 225°.			163, 164	
High Power Rod Heaters		0 to 1533 K	0 to 820 K		
THV*B2+107 THV*B2+180 THV*B2+227 THV*B2+353	Heater at Column B, Row 2, thermocouples, 107 cm (10°), 180 cm (319°), 227 cm (308°), and 353 cm (270°) above bottom of heated length.			165, 166, 167 168, 169 170	S-IB-2 only S-IB-2 only
THV*B3+114 THV*B3+184 THV*B3+229 THV*B3+354	Heater at Column B, Row 3, thermocouples 114 cm (97°), 184 cm (353°) 229 cm (304°), and 354 cm (180°) above bottom of heated length.			171, 172 173 174, 175 176, 177	 S-IB-2 only
THV*B4-12 THV*B4+140 THV*B4+170 THV*B4+256	Heater at Column B, Row 4, thermocouples -12 cm (250°), 140 cm (228°), 170 cm (129°), and 256 cm (131°) above bottom of heated length.			178, 179 180 181, 182 183, 184	 S-IB-2 only
THV*C2+15 THV*C2+137 THV*C2+168 THV*C2+254	Heater at Column C, Row 2, thermocouples 15 cm (180°), 137 cm (351°), 168 cm (78°), and 254 cm (303°) above bottom of heated length.			185, 186 187, 188 189, 190 191, 192	
THV*C3+140 THV*C3+231 THV*C3+292	Heater at Column B, Row 3, thermocouples 140 cm (174°), 231 cm (56°), and 292 cm (180°) above bottom of heated length.			193, 194 195, 196 197, 198	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
MATERIAL TEMPERATURE (continued)					
High Power Bus Heaters (continued)					
THV*C4+20	Heater at Column C, Row 4,			199, 200	
THV*C4+142	thermocouples 20 cm (222°), 142 cm			201, 202	
THV*C4+187	(171°), 187 cm (182°), and 257 cm			203, 204	
THV*C4+257	(65°) above bottom of heated length.			205, 206	
THV*D2+16	Heater at Column D, Row 2,			207, 208	
THV*D2+13	thermocouples 16 cm (115°), 138 cm			209, 210	
THV*D2+185	(59°), 185 cm (31°), and 254 cm			211, 212	
THV*D2+254	(351°) above bottom of heated length.			213, 214	
THV*D3+109	Heater at Column D, Row 3,			215, 216	
THV*D3+227	thermocouples 109 cm (217°), 227 cm			217, 218	
THV*D3+354	(350°), and 354 cm (90°) above bottom of heated length.			219, 220	
THV*D4+179	Heater at Column D, Row 4,			221, 222	
THV*D4+226	thermocouples 179 cm (26°), 226 cm			223, 224	
THV*D4+352	(177°), and 352 cm (370°) above bottom of heated length.			225, 226	
Low Power Bus Heaters		0 to 1533 K	0 to 820 K		
THV*A1+115	Heater at Column A, Row 1, thermocouple 115 cm (126°) above bottom of heated length.			227, 228	
THV*A2+112	Heater at Column A, Row 2,			229, 230	
THV*A2+182	thermocouples 112 cm (298°),			231, 232	
THV*A2+353	182 cm (236°), and 353 cm (180°) above bottom of heated length.			233, 234	
THV*A3+137	Heater at Column A, Row 3,			235, 236	
THV*A3+208	thermocouples 137 cm (282°),			237, 238	
THV*A3+228	208 cm (121°), 228 cm (174°), and			239, 240	
THV*A3+291	291 cm (270°) above bottom of heated length.			241, 242	
THV*A4+115	Heater at Column A, Row 4,			243, 244	
THV*A4+185	thermocouples 115 cm (73°), 185 cm			245, 246	
THV*A4+355	(0°), and 355 cm (270°) above bottom of heated length.			247, 248	
THV*A5+185	Heater at Column A, Row 5, thermocouple 185 cm (315°) above bottom of heated length.			249, 250	
THV*B1+11	Heater at Column B, Row 1,			251, 252	
THV*B1+183	thermocouples 11 cm (168°),			253, 254	
THV*B1+253	183 cm (131°), and 253 cm (1°) above bottom of heated length.			255, 256	
THV*B5+133	Heater at Column B, Row 5,			257, 258	
THV*B5+180	thermocouples 133 cm (113°),			259, 260	
THV*B5+252	180 cm (92°), and 252 cm (22°) above bottom of heated length.			261, 262	
THV*C1+140	Heater at Column C, Row 1,			263, 264	
THV*C1+211	thermocouples 140 cm (20°),			265, 266	
THV*C1+232	211 cm (212°), 232 cm (2[illegible]°), and			267, 268	
THV*C1+292	292 cm (0°) above bottom of heated length.			269, 270	
THV*C5+133	Heater at Column C, Row 5,			271, 272	
THV*C5+207	thermocouples 133 cm (180°),			273, 274	
THV*C5+228	207 cm (4°), 228 cm (70°) and			275, 276	
THV*C5+290	290 cm (180°) above bottom of heated length.			277, 278	
THV*D1+131	Heater at Column D, Row 1,			279, 280	
THV*D1+178	thermocouples 131 cm (60°),			281, 282	
THV*D1+251	178 cm (80°), and 251 cm (3°) above bottom of heated length.			283, 284	
THV*D5+13	Heater at Column D, Row 5,			285, 286	
THV*D5+139	thermocouples 13 cm (291°),			287, 288	
THV*D5+184	139 cm (249°), and 184 cm (226°) above bottom of heated length.			289, 290	
THV*E1+172	Heater at Column E, Row 1, thermocouple 172 cm (26°) above bottom of heated length.			291, 292	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	System	Figure[a]	Measurement Comments[b]
MATERIAL TEMPERATURE (continued)					
Low Power Bus Heaters (continued)					
TVH*E2+109 THV*E2+181 THV*E2+354	Heater at Column E, Row 2, thermocouples 109 cm (117°), 181 cm (67°), and 354 cm (0°) above bottom of heated length.			293, 294 295, 296 297, 298	
THV*E3+141 THV*E3+211 THV*E3+231 THV*E3+292	Heater at Column E, Row 3, thermocouples 141 cm (250°), 211 cm (45°), 231 cm (127°), and 292 cm (180°) above bottom of heated length.			299, 300 301, 302 303, 304 305, 306	
THV*E4+112 THV*E4+183 THV*E4+354	Heater at Column E, Row 4, thermocouples 112 cm (251°), 183 cm (205°), and 354 cm (90°) above bottom of heated length.			307, 308 309, 310 311, 312	
THV*E5+181	Heater at Column E, Row 5, thermocouple 181 cm (66°) above bottom of heated length.			313	S-IB-1 only
PRESSURE					
Intact Loop					
PI*1	Hot leg, Spool 1, 60 cm from vessel center.	0 to 17.24 MPa	0 to 21.95 MPa	314, 315	
PI*14L	Cold leg, Spool 14, 700 cm from downcomer center (low range).	0 to 6.89 MPa	0 to 9.24 MPa	316, 317	
PI*22L	Cold leg, Spool 22, 60 cm from downcomer center (low range).	0 to 3.48 MPa	0 to 3.445 MPa	318, 319	
Broken L[illegible]					
PB*50	Hot leg, Spool 50, 74 cm from vessel center.	0 to 17.24 MPa	0 to 9.164 MPa	320, 321	
PB*65	Cold leg, Spool 65, 565 cm from downcomer center.	0 to 17.24 MPa	0 to 20.05 MPa	322	S-IB-2 only
PB*74L	Cold leg, Spool 74, 209 cm from downcomer center (low range).	0 to 6.89 MPa	0 to 9.208 MPa	323, 324	
PB*76U	Cold leg, Spool 76U, downstream of break nozzle, 152 cm from downcomer center.	0 to 17.24 MPa	0 to 22.34 MPa	325, 326	
PB*76D	Cold leg, Spool 76, 191 cm from downcomer center.	0 to 17.24 MPa	0 to 22.9 MPa	327	S-IB-2 only
PB*76D(L)	Cold leg, Spool 76, downstream of break nozzle, 152 cm from downcomer center (low range).	0 to 3.45 MPa	0 to 3.45 MPa	328	S-IB-2 only
PB*79(L)	Cold leg, Spool 79, 96 cm from downcomer center (low range).	0 to 6.89 MPa	0 to 9.164 MPa	329, 330	
Vessel					
PV*DC+29	In downcomer, 29 cm above cold leg centerline.	0 to 17.24 MPa	0 to 21.72 MPa	331, 332	
PV*DC-435(L)	In downcomer instrument spool, 435 cm below cold leg centerline (low range).	0 to 6.89 MPa	0 to 9.274 MPa	333, 334	
PV*LP-578L	In vessel lower plenum, 578 cm below cold leg centerline (low range).	0 to 6.89 MPa	0 to 9.214 MPa	335, 336	
PV*UP-13	In vessel upper plenum, 13 cm below cold leg centerline.	0 to 17.24 MPa	0 to 21.64 MPa	337, 338	
PV*UH+421	In vessel upper head, 421 above cold leg centerline.	0 to 17.24 MPa	0 to 20.26 MPa	339, 340	
Coolant Injecton ECC System					
PCI*A3+277	In accumulator for intact loop.	0 to 17.24 MPa	0 to 22.58 MPa	341, 342	
Steam Generator					
PIS+1117	Intact loop steam generator steam dome, 1117 cm above top of tube sheet.	0 to 17.24 MPa	0 to 21.06 MPa	343, 344	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	System	Figure[a]	Measurement Comments[b]
PRESSURE (continued)					
Steam Generator (continued)					
PBS*1117	Broken loop steam generator steam dome, 1117 cm above top of tube sheet.	0 to 17.24 MPa	0 to 22.22 MPa	345	S-IB-2 only
PSC*IGSTM	Intact loop steam exit.	0 to 6.89 MPa	0 to 8.22 MPa	346, 347	
PSC*BGSTM	Broken loop steam exit.	0 to 6.89 MPa	0 to 8.57 MPa	348, 349	
Pressurizer					
P*PRZ*146	In pressurizer steam dome, 146 cm above exit to surge line.	0 to 17.24 MPa	0 to 20.81 MPa	350, 351	
Pressure Suppression System					
PPS*1T*384	In pressure suppression system, 384 cm above bottom of tank.	0 to 3.447 MPa	0 to 3.444 MPa	352, 353	
DIFFERENTIAL PRESSURE	Elevation difference between transducer taps is zero unless specified otherwise.				
Intact Loop					
D-V13A*I1	Vessel upper plenum, 13 cm (0°) below cold leg centerline, to hot leg, Spool 1, 60 cm from vessel center. Upper plenum tap is 33 cm below Spool 1 tap.	±24.87 kPa	±33.31 kPa	354, 355	
DPI*1*3C	Hot leg, Spool 1, 60 cm from vessel center to hot leg, Spool 3C, 204 cm from vessel center.	±24.87 kPa	±33.96 kPa	356, 357	
DPI*3C*5	Hot leg, Spool 3C, 204 cm from vessel center, to hot leg, Spool 5, 363 cm from vessel center, Spool 3C tap is 58 cm below Spool 5 tap.	±74.61 kPa	±102.2 kPa	358, 359	
DIG-55E55X	Steam generator inlet plenum to outlet plenum. Inlet and outlet plenum taps are 55 cm below top of tube sheet.	±24.87 kPa	±33.09 kPa	360	S-IB-1 only
DPI*5X9	Hot leg, Spool 5, 363 cm from vessel center to cold leg, Spool 9, 1017 cm from downcomer center. Elevation difference between taps 39 cm.	±344.75 kPa	±342.4 kPa	361, 362	
DPI*9*14	Cold leg, Spool 9, 1017 cm from downcomer center to cold leg Spool 14, 700 cm from downcomer center. Spool 9 tap is 380 cm above Spool 14 tap.	±13.79 kPa	±13.88 kPa	363, 364	
DPI*14*18	Cold leg, Spool 14, 700 cm from downcomer center to cold leg, Spool 18, 332 cm from downcomer center. Spool 14 tap is 257 cm below Spool 18 tap.	±74.61 kPa	±102.2 kPa	365	S-IB-2 only
DPI*21*18	Cold leg, Spool 18, 332 cm from downcomer center to cold leg, Spool 21, 114 cm from downcomer center. Spool 18 tap is 25 cm below Spool 21 tap. Across intact loop pump.	±3447.5 kPa	±3445 kPa	366, 367	
DPI*21*22	Cold leg, Spool 21, 114 cm from downcomer center to cold leg, Spool 22, 60 cm from downcomer center.	±12.45 kPa	±16.74 kPa	368, 369	
D*I22*VD29	Cold leg, Spool 22, 60 cm from downcomer center to downcomer inlet annulus, 29 cm above cold leg centerline. Spool 22 tap is 24 cm below inlet annulus top.	±24.90 kPa	±33.09 kPa	370, 371	
Broken Loop					
D-V13A*50	Vessel upper plenum, 13 cm (0°) below cold leg centerline to hot leg Spool 50, 94 cm from vessel center. Upper plenum tap is 33 cm below Spool 50 tap.	±74.61 kPa	±101.1 kPa	372, 373	
DB*50*55	Hot leg, Spool 50, 94 cm from vessel center to hot leg Spool 55, 240 cm from vessel center.	±74.61 kPa	±115.2 kPa	374, 375	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[c] Detector	Data Acquisition Range[c] System	Figure[a]	Measurement Comments[b]
DIFFERENTIAL PRESSURE (continued)					
Broken Loop (continued)					
DB*55*57	Hot leg, Spool 55, 240 cm from vessel center to Spool 57, 301 cm from vessel center Spool 55, 61 cm below Spool 57.	±24.90 kPa	±33.73 kPa	376, 377	
DBG-55E55X	Steam generator inlet plenum to outlet plenum. Inlet and outlet plenum taps are 55 cm below top of tube sheet.	±689.5 kPa	±885.7 kPa	37[illegible]	S-IB1 only
DPB*57*62	Hot leg, Spool 57, 301 cm from vessel center. Cold leg, Spool 62, 942 cm from downcomer center. Elevation difference between taps is 9 cm.	±24.37 kPa	±33.73 kPa	379, 380	
DPB*62*65	Cold leg, Spool 62, 942 cm from downcomer center to cold leg, Spool 65, 565 cm from downcomer center. Elevation difference between taps is 377 cm.	±74.61 kPa	±104.3 kPa	381, 382	
DB*65*73	Cold leg, Spool 65, 565 cm from downcomer center to cold leg, Spool 73, 341 cm from downcomer center. Spool 65 tap is 233 cm below Spool 73 tap.	±74.61 kPa	±101.3 kPa	383, 384	
DB*74*73	Cold leg, Spool 73, 341 cm from downcomer across broken loop pump to cold leg, Spool 74, 202 cm from downcomer center. Spool 73 tap is 58 cm below Spool 74 tap.	±689.5 kPa	±885.7 kPa	385, 386	
DB*74*76U	Cold leg, Spool 74, 220 cm from downcomer center to cold leg, Spool 76, Tap U, 152 cm from downcomer center.	±1379.5 kPa	±1375 kPa	387, 388	
DB*76U*76D	Cold leg, Spool 76, Tap U, 152 cm from downcomer center to Spool 76, Tap D, 209 cm from downcomer center.	±1034.2 kPa	±13760 kPa	389, 390	
DB*76F*76D	Cold leg, Spool 76, Tap F, 191 cm from downcomer center, across drag screen to cold leg, Spool 76, Tap D, 209 cm from downcomer center.	±10342 kPa	±13760 kPa	391, 392	
DB*76D*79	Cold leg, Spool 76, 152 cm from downcomer center to cold leg, Spool 79, 76 cm from downcomer center.	±1379 kPa	±1376 kPa	393, 394	
D*B79*VD29	Cold leg Spool 79, 89 cm from downcomer center to downcomer inlet annulus, 29 cm above cold leg centerline. Spool 79 tap is 29 cm below inlet annulus.	±124.35 kPa	±170.3 kPa	395, 396	
DPB.50D*76	Cold leg, Spool 76, Tap F, 209 cm from downcomer center. Pitot tube located 0.5 pipe diameter above bottom of pipe ID.	±689.5 kPa	±690.1 kPa	397, 398	
DPB.25D*76	Cold leg, Spool 76, Tap F, 209 cm from downcomer center. Pitot tube located 0.25 pipe diameter above bottom of pipe ID.	±689.5 kPa	±689.1 kPa	399, 400	
DPB.75D*79	Cold leg, Spool 79, 89 cm from downcomer center. Pitot tube located 0.75 pipe diameter above bottom of pipe ID.	±124.35 kPa	±170.2 kPa	401	S-IB-1 only
DPB.50D*79	Cold leg, Spool 79, 89 cm from downcomer center. Pitot tube located 0.50 pipe diameter above bottom of pipe ID.	±198.96 kPa	±266.0 kPa	402	S-IB-1 only
DPB.25D*79	Cold leg, Spool 79, 89 cm from downcomer center. Pitot tube located 0.25 pipe diameter above bottom of pipe ID.	±198.96 kPa	±270.2 kPa	403, 404	
Vessel					
DVD*29*421	Downcomer inlet annulus, 29 cm above cold leg centerline to vessel lower head, 421 cm above cold leg centerline. Elevation difference between taps is 392 cm.	±344.75 kPa	±343.9 kPa	405, 406	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
LIQUID LEVEL					
Vessel					
LVD+29-578	Downcomer inlet annulus, 29 cm above cold leg centerline to vessel lower plenum, 578 cm below cold leg centerline. Elevation difference between taps is 607 cm.	±344.75 kPa	±341 kPa	407, 408	
LVD+29-170	Downcomer inlet annulus, 29 cm above cold leg centerline to downcomer extension, 170 cm below cold leg centerline. Elevation difference between taps is 199 cm.	±24.90 kPa	±33.33 kPa	409, 410	
LVD170-435	Downcomer extension, 170 cm below cold leg centerline to 435 cm below cold leg centerline. Elevation difference between taps is 265 cm.	±74.69 kPa	±107.6 kPa	411, 412	
LVD435-578	Downcomer extension, 435 cm below cold leg centerline to vessel lower plenum, 578 cm below cold leg centerline. Elevation difference between taps is 143 cm.	±24.87 kPa	±36.68 kPa	413	S-IB-2 only
LV+421-578	Vessel upper head, 421 cm above cold leg centerline to vessel lower plenum 578 cm below cold leg centerline. Elevation difference between taps is 999 cm.	±124.34 kPa	±168.4 kPa	414, 415	Test S-IB-1, detector saturated from t = 10s to t = 40s.
LV+421-13H	Vessel upper head, 421 cm above cold leg centerline to vessel upper plenum 13 cm (180°) below cold leg centerline. Elevation difference between taps is 434 cm.	±74.61 kPa	±102.4 kPa	416, 417	Test S-IB-1, detector saturated from t = 10s to t = 40s.
LV+421+160	Vessel upper head, 421 cm above cold leg centerline to 160 cm above cold leg centerline. Elevation difference between taps is 261 cm.	±74.61 kPa	±102.3 kPa	418, 419	
DV+160+135	Vessel upper head, 160 cm above cold leg centerline to 135 cm above cold leg centerline. Elevation difference between taps is 25 cm.	±12.43 kPa	±16.41 kPa	420, 421	Test S-IB-1, detector saturated from t = 10s to t = 60s.
LV+135-13H	Vessel upper head, 135 cm above cold leg centerline to 13 cm (180°) below cold leg centerline. Elevation difference between taps is 148 cm.	±24.87 kPa	±35.30 kPa	422, 423	
LV-13H-578	Vessel upper plenum, 13 cm (180°) below cold leg centerline to lower plenum, 578 cm below cold leg centerline. Elevation difference between taps is 565 cm.	±124.5 kPa	±176.1 kPa	424, 425	
LV-13H-105	Vessel upper plenum, 13 cm (180°) below cold leg centerline to 105 cm below cold leg centerline. Elevation difference between taps is 92 cm.	±24.87 kPa	±33.60 kPa	426, 427	
LV-105-195	Vessel upper plenum, 105 cm below cold leg centerline to core region 195 cm below cold leg centerline. Elevation difference between taps 90 cm.	±24.87 kPa	±33.31 kPa	428, 429	
LV-195-278	Vessel core region, 195 cm below cold leg centerline to 278 cm below cold leg centerline. Elevation difference between taps is 83 cm.	±24.87 kPa	±33.31 kPa	430, 431	
LV-278-360	Vessel core region, 278 cm below cold leg centerline to 360 cm below cold leg centerline. Elevation difference between taps is 82 cm.	±24.87 kPa	±34.91 kPa	432, 433	
LV-360-442	Vessel core region, 360 cm below cold leg centerline to 442 cm below cold leg centerline. Elevation difference between taps is 82 cm.	±24.87 kPa	±34.79 kPa	434, 435	
LV-442-501	Vessel core region, 442 cm below cold leg centerline to 501 cm below cold leg centerline. Elevation difference between taps is 59 cm.	±12.43 kPa	±17.38 kPa	436, 437	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	System	Figure[a]	Measurement Comments[b]
LIQUID LEVEL (continued)					
Vessel (continued)					
LV-501-578	Vessel lower core region, 501 cm below cold leg centerline to lower plenum 578 cm below cold leg centerline. Elevation difference between taps is 396 cm.	±12.45 kPa	±16.85 kPa	438, 439	
Steam Generator					
Intact Loop					
LIP970-55E	Long tube upflow side of apex, 970 cm above top of tube sheet to inlet plenum, 55 cm below top of tube sheet. Elevation difference between taps is 1025 cm.	±124.5 kPa	±164.5 kPa	440, 441	
LIS1117+50	Secondary side of steam generator, 1117 cm to 50 cm above top of tube sheet. Elevation difference between taps is 1067 cm.	±124.5 kPa	±167.4 kPa	442, 443	
DPSC*IGFDW	Across orifice in feedwater line for intact loop.	±148.16 kPa	±259.01 kPa	444, 445	
DPSC*IGSTM	Across venturi tube in discharge line from steam generator for intact loop.	±169.3 kPa	±296.3 kPa	446, 447	
Broken Loop					
LBS1117+50	Secondary side of steam generator 1117 cm to 50 cm above top of tube sheet. Elevation difference between taps is 1067 cm.	±124.5 kPa	±169.8 kPa	448, 449	
DPSC*BGFDW	Across orifice in feedwater line for broken loop.	±124.35 kPa	±217.61 kPa	450, 451	
DPSC*BGSTM	Across venturi tube in discharge line from steam generator for broken loop.	±138.69 kPa	±242.73 kPa	452, 453	
Coolant Injection FCC System					
LCI*A3+277	Top to bottom of accumulator for intact loop. Elevation difference between taps is 277 cm.	±74.69 kPa	±101.4 kPa	454, 455	
LCI*T7+277	HPIS supply water tank, 277 cm to 0 cm from bottom of tank. Elevation difference 277 cm.	±68.95 kPa	±91.79 kPa	456, 457	
Pressurizer					
DP*PRZ*13C	Pressurizer bottom 25 cm above exit to surge line to intact loop hot leg Spool 3C. Elevation difference between taps is 157 cm.	±3447 kPa	±3442 kPa	458, 459	
LPRZ146+25	Liquid level for pressurizer. Elevation difference between taps is 121 cm.	±12.45 kPa	±18.15 kPa	460, 461	
Pressure Suppression System					
LPS+384+0	Pressure suppression tank, 384 cm to 0 cm from bottom of tank. Elevation difference 384 cm.	±74.61 kPa	±105.3 kPa	462	S-IB1 only
LPS+105+48	Pressure suppression tank, 105 cm to 48 cm from botton of tank. Elevation difference 57 cm.	±12.43 kPa	±16.39 kPa	463	S-IB-2 only
Feedwater Tank					
LSC+488+97	Feedwater tank, 488 cm to 97 cm from bottom of tank. Elevation difference 391 cm.	±65.8 kPa	±37.55 kPa	464	S-IB-1 only
VOLUMETRIC FLOW RATE	Turbine flowmeter, bidirectional.				
Intact Loop					
QI*1	Hot leg, Spool 1, 38 cm from vessel center.	±1.9 to ±19 ℓ/s	±25.0 ℓ/s	465, 466	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	System	Figure[a]	Measurement Comments[b]
VOLUMETRIC FLOW RATE (continued)					
Intact Loop (continued)					
QI*6	Hot leg, steam generator inlet leg, Spool 6, 408 cm from vessel center.	±.50 to ±5.0 ft/s	±25 ft/s	467, 468	
QI*15	Cold leg, Spool 15, 429 cm from downcomer center.	±5.6 to ±56 ft/s	±25 ft/s	469, 470	
QI*21	Cold leg, Spool 21, 146 cm from downcomer center.	±1.9 to ±19 ft/s	±30 ft/s	471, 472	
QI*22	Cold leg, Spool 22, 38 cm from downcomer center.	±1.9 to ±19 ft/s	±25 ft/s	473, 474	
Broken Loop					
QB*50	Hot leg, Spool 50, 100 cm from vessel center.	±1.73 to ±17.3 ft/s	±10.0 ft/s	475, 476	
QB*57	Hot leg, steam generator inlet leg, Spool 57, 200 cm from vessel center.	±1.7 to ±17.0 ft/s	±10.0 ft/s	477, 478	
QB*73	Cold leg, Spool 73, 305 cm from downcomer center.	±1.7 to ±17.0 ft/s	±10 ft/s	479, 480	
QB*74	Cold leg, Spool 74, 186 cm from downcomer center.	±1.73 to ±17.3 ft/s	±10.0 ft/s	481, 482	
QB*79	Cold leg, Spool 79, 110 cm from downcomer center.	±2.07 to ±20.7 ft/s	±44.0 ft/s	483, 484	
Vessel					
QV*DC-423	Vessel downcomer, 423 cm below cold leg centerline.	±1.50 to ±15.1 ft/s	±39.0 ft/s	485, 486	
QV*UP+1	Core exit, 1 cm above cold leg centerline.	±2.8 to ±28 ft/s	±25 ft/s	487, 488	
QV*GT+321	In vessel guide tube, 321 cm above cold leg centerline.	±0.035 to ±0.35 ft/s	±3.0 ft/s	489, 490	
QV*BYPASS	In upper head heat-up bypass line.	±0.48 to ±4.8 ft/s	±3.1 ft/s	491	S-IB-1 only
Coolant Injection					
QCI*A3	In line leading from accumulator for intact loop.	±0.31 to ±3.1 ft/s	±3.0 ft/s	492, 493	
QCI*ILLPIS	In line leading from low pressure injection pump for intact loop.	±0.030 to ±0.30 ft/s	±0.30 ft/s	494	S-IB-2 only
Pressurizer					
Q*PRZ-30	In pressurizer surge line 30 cm below pressurizer exit.	±0.32 to ±3.20 ft/s	±8.5 ft/s	495, 496	
MOMENTUM FLUX					
Intact Loop					
FI*1	Hot leg, Spool 1, 38 cm from vessel center.	±1000 gm	±1000 gm	497, 498	
FI*5	Hot leg, Spool 5, 245 cm from vessel center.	±1000 gm	±1000 gm	499	S-IB-1 only
FI*9	Cold leg, Spool 9, 1007 cm from downcomer center.	±1000 gm	±1000 gm	500	S-IB-2 only
FI*15	Cold leg, Spool 15, 764 cm from downcomer center.	±1500 gm	±1500 gm	501, 502	
FI*22	Cold leg, Spool 22, 38 cm from downcomer center.	±1500 gm	±1500 gm	503, 504	Test S-IB-1, detector power-sensitive after t = 180s. Data beyond 180s removed from plot.
Broken Loop					
FB*50	Hot leg, Spool 50, 104 cm from vessel center.	±1000 gm	±1000 gm	505, 506	
FB*57	Hot leg, Spool 57, 311 cm from vessel center.	±1500 gm	±1500 gm	507, 508	
FB*62	Cold leg, Spool 62, 933 cm from downcomer center.	±1500 gm	±1500 gm	509, 510	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
MOMENTUM FLUX (continued)					
Broken Loop (continued)					
FB*74	Cold leg, Spool 74, 208 cm from downcomer center.	±1800 gm	±1800 gm	511, 512	
FB*76	Cold leg, Spool 76, 198 cm from downcomer center.	±1500 gm	±1500 gm	513, 514	
FB*79	Cold leg, Spool 79, 84 cm from downcomer center.	±3500 gm	±3500 gm	515, 516	
Vessel					
FV*DC-441	In downcomer, 441 cm below cold leg centerline.	±1000 gm	±1000 gm	517, 518	
FV*UP-9	In upper plenum, 9 cm below cold leg centerline.	±1000 gm	±1000 gm	519, 520	
FV*GT+330	In guide tube, 330 cm above cold leg centerline.	±450 gm	±450 gm	521, 522	
DENSITY					
Intact Loop		1.6 to 1600 kg/m^3	0 to 1600 kg/m^3		
RI*1T RI*1B	Hot leg, Spool 1, 77 cm from vessel center, T (tangential), B (body).			523, 524 525, 526	
RI*5M	Hot leg, Spool 5, 367 cm from vessel center, M (middle).			527, 528	
RI*9M	Cold leg, Spool 9, 1018 cm from downcomer center, M (middle).			529, 530	
RI*21T RI*21B	Cold leg, Spool 21, 131 cm from downcomer center, T (tangential), B (body).			531, 532 533, 534	
RI*22T RI*22B	Cold leg, Spool 22, 73 cm from downcomer center, T (tangential), B (body).			535 535	S-IB-1 only S-IB-1 only
Broken Loop		1.6 to 1600 kg/m^3	0 to 1600 kg/m^3		
RB*50T RB*50M	Hot leg, Spool 50, 64 cm from vessel center. T (top), M (middle).			537, 538 539	S-IB-2 only
RB*57M	Hot leg, Spool 57, 302 cm from downcomer center. M (middle).			540	S-IB-2 only
RB*62M	Cold leg, Spool 62, 938 cm from downcomer center. M (middle).			541, 542	
RB*73	Cold leg, Spool 73, 350 cm from downcomer center.			543, 544	
RB*74T RB*74M	Cold leg, Spool 74, 223 cm from downcomer center. T (top), M (middle).			545, 546 547, 548	
RB*76T RB*76M	Cold leg, Spool 76, 170 cm from downcomer center. T (top), M (middle).			549, 550 551, 552	
RB*79T RB*79M	Cold leg, Spool 79, 66 cm from downcomer center. T (top), M (middle).			553, 554 555, 556	
Vessel		1.6 to 1600 kg/m^3	0 to 1600 kg/m^3		
RV*DC-72	Vessel downcomer, 72 cm below cold leg centerline.			557, 558	
RV*DC-260	Vessel downcomer, 260 cm below cold leg centerline.			559, 560	
RV*DC-456	Vessel downcomer, 456 cm below cold leg centerline.			561, 562	
RV*AB-6	Six cm below bottom of core heated length, 502 cm below cold leg centerline, between heater rod Columns A and B.			563, 564	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	Data Acquisition Range[a] System	Figure[a]	Measurement Comments[b]
DENSITY (continued)					
Vessel (continued)					
RV*23+13	13 cm above bottom of core heated length, 483 cm below cold leg centerline, between heater rod Rows 2 and 3.			565, 566	
RV*23+113	113 cm above bottom of core heated length, 383 cm below cold leg centerline, between heater rod Rows 2 and 3.			567, 568	
RV*AB+173	173 cm above bottom of core heated length, 323 cm below cold leg centerline, between heater rod Columns A and B.			569, 570	
RV*23+183	183 cm above botom of core heated length, 313 cm below cold leg centerline, between heater rod Rows 2 and 3.			571, 572	
RV*23+253	253 cm above bottom of core heated length, 243 cm below cold leg centerline, between heater rod Rows 2 and 3.			573, 574	
RV*23+342	342 cm above bottom of core heated length, 153 cm below cold leg centerline, between heater rod Rows 2 and 3.			575	S-IB-1 only
RV*UP-11	In vessel at base of core flow instrument housing, 11 cm below cold leg centerline.			576, 577	
RV*UH+339	In vessel upper head, 339 cm above cold leg centerline.			578, 579	
RV*UH+173	In vessel upper head, 173 cm above cold leg centerline.			580, 581	
CORE POWER CHARACTERISTICS					
High Power Bus					
IV*HIPWBUS	Core current.	0 to 10 000 A	0 to 10 030 A	582, 583	
EV*HIPWBUS	Core voltage.	0 to 400 V	0 to 402 V	584, 585	
Low Power Bus					
IV*LOPWBUS	Core current.	0 to 10 000 A	0 to 9330 A	586, 587	
EV*LOPWBUS	Core voltage.	0 to 400 V	0 to 402 V	588, 589	
Calculated Power					
EWH*HIC	Power for high power bus.			590, 591	
EWH*LOC	Power for low power bus.			592, 593	
EWH*TOTC	Total power for high and low power bus.			594, 595	
Intact Pump					
II*PUMP	Pump current.	250 A	250 A	596, 597	
EI*PUMP	Pump voltage.	402 V	402 V	598, 599	
WI*PUMP	Pump speed.	384 Rad/s	400 Rad/s	600, 601	
Broken Pump					
EWB*PUMP	Pump power.	82 K Watts	20 K Watts	602, 603	
WB*PUMP	Pump speed.	2618 Rad/s	2618 Rad/s	604, 605	
VALVE POSITIONS					
Intact Loop					
HSC*ICFDW	Feedwater valve position.	0.6 V = Closed 4.2 V = Full open	10 V	606, 607	

BEST DOCUMENT AVAILABLE

Table 4. (continued)

Measurement	Location and Comments[a]	Data Acquisition Range[a] Detector	System	Figure[a]	Measurement Comments[b]
VALVE POSITIONS (continued)					
Intact Loop (continued)					
XSC*1GSTM	Steam exit valve position.	1.6 V = Closed 4.8 V = Full open	10 V	608, 609	
Broken Loop					
XSC*BGFDW	Feedwater valve position.	0.5 V = Closed 4.3 V = Full open	10 V	610, 611	
XSC*BGSTM	Steam exit valve position.	0.8 V = Closed 4.4 V = Full open	10 V	612, 613	

a. Statements at the beginning of a measurement category regarding location and comments, range, and figure apply to all subsequent measurements within the given category unless specified otherwise.

b. Detectors subjected to overrange conditions during portions of the test were capable of withstanding those conditions without change in operating or measuring characteristics when the physical conditions were again within the detector range.

c. Transducer not calibrated below stated detector range. Use data for trend information only.

BEST DOCUMENT AVAILABLE

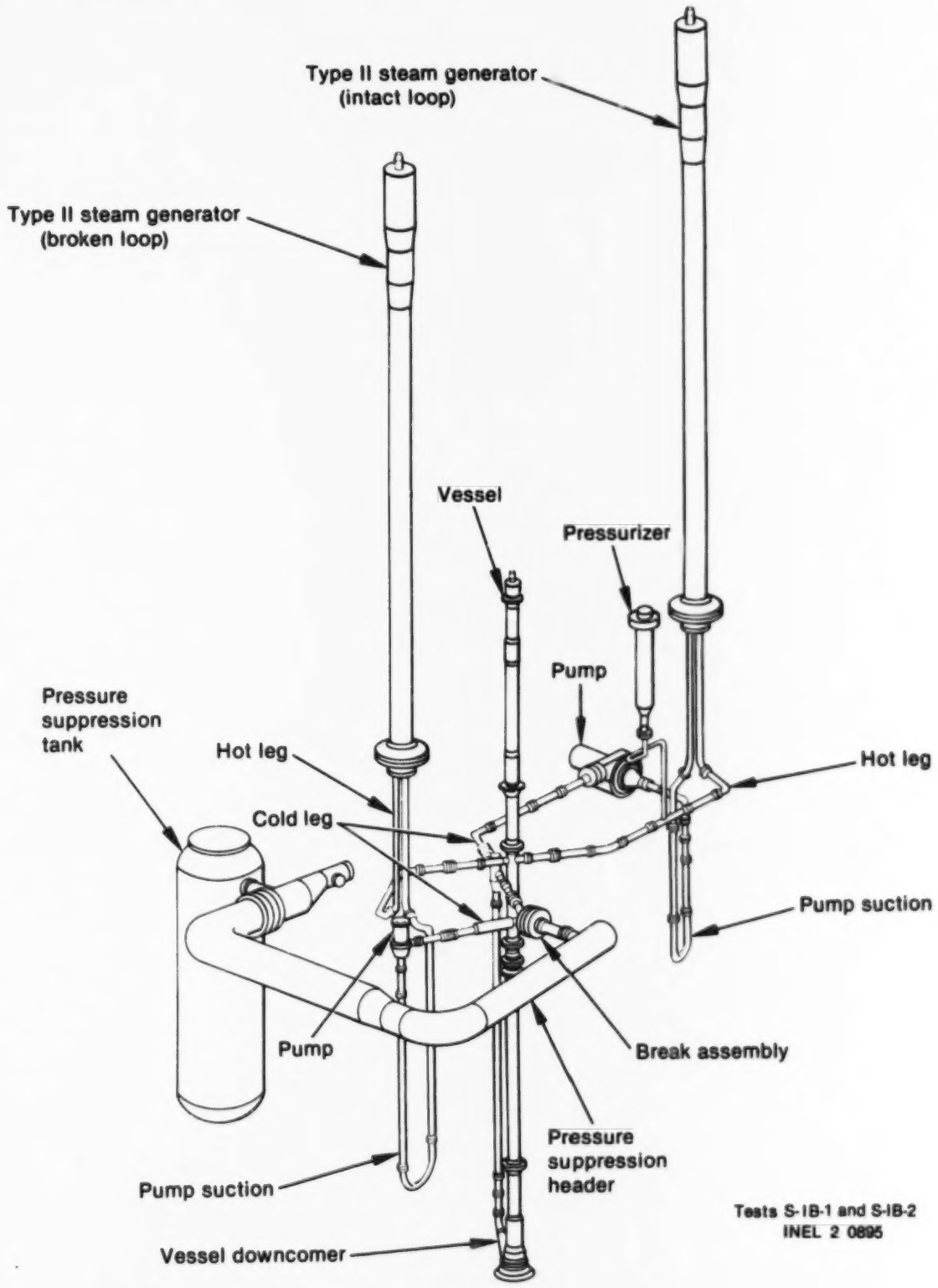


Figure 1. Semiscale Mod-2A system configuration for cold-leg intermediate-break test—isometric.

BEST DOCUMENT AVAILABLE

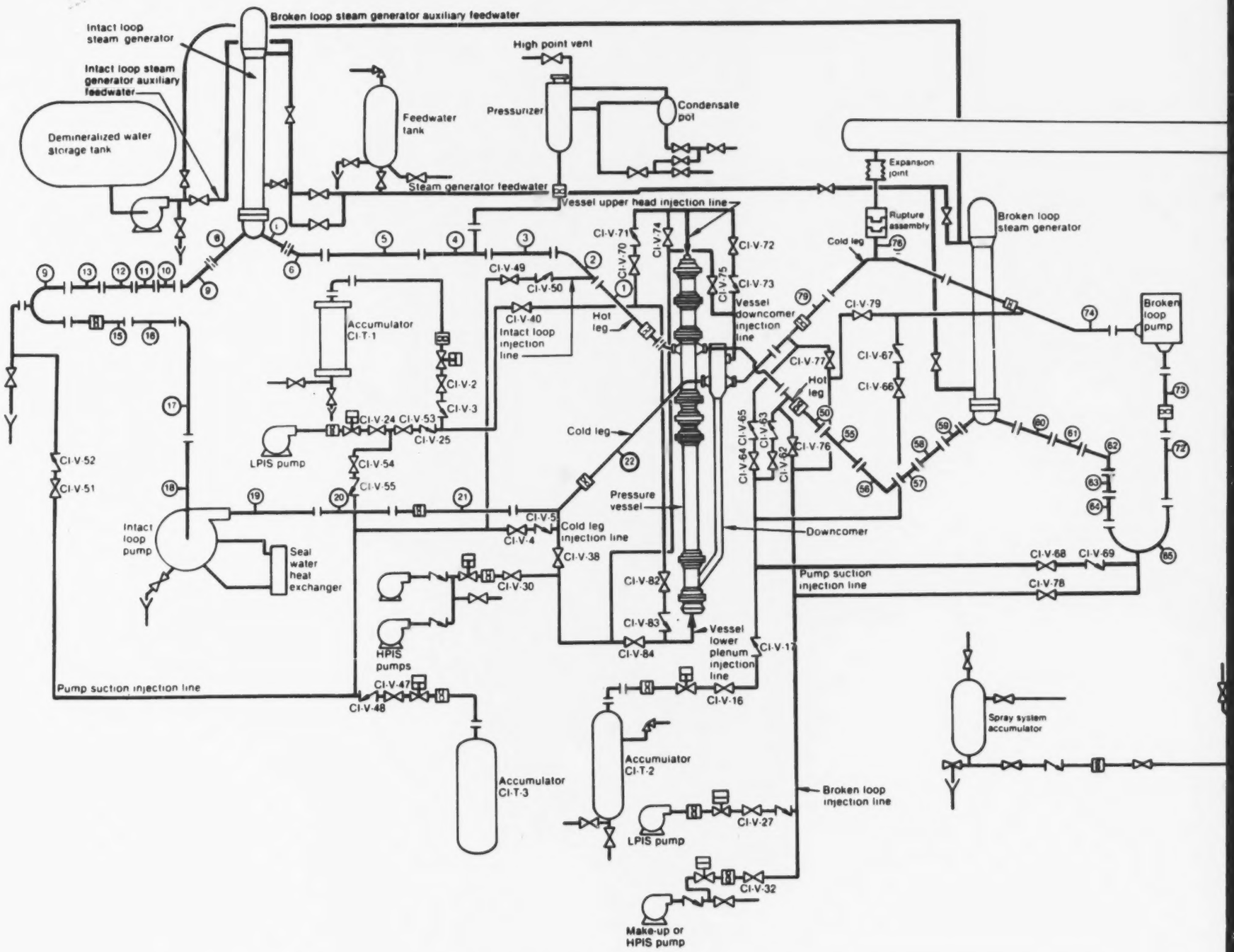


Figure 2. Semiscale Mod-2A system configuration for cold-leg intermediate-break test—schematic.

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

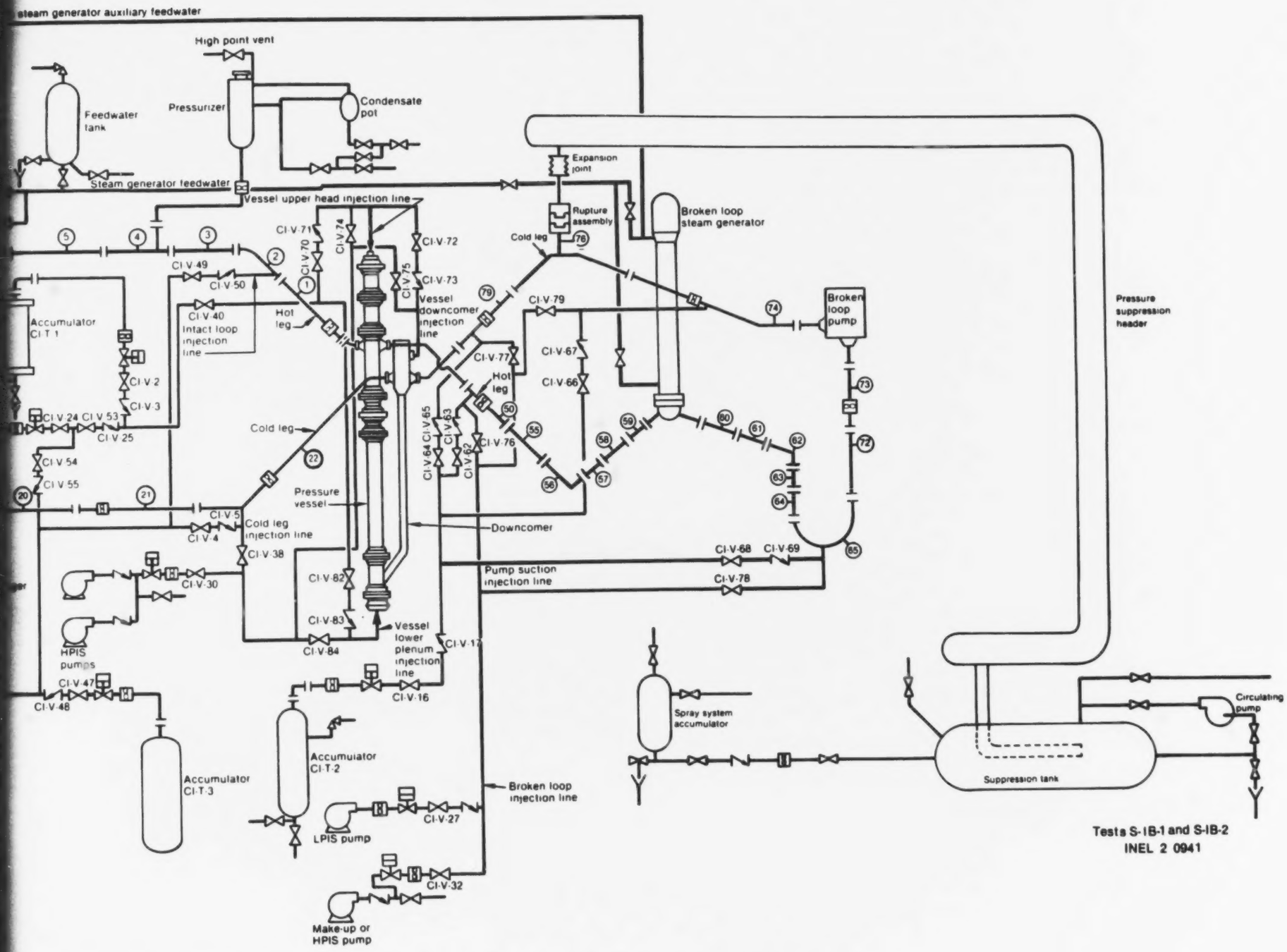
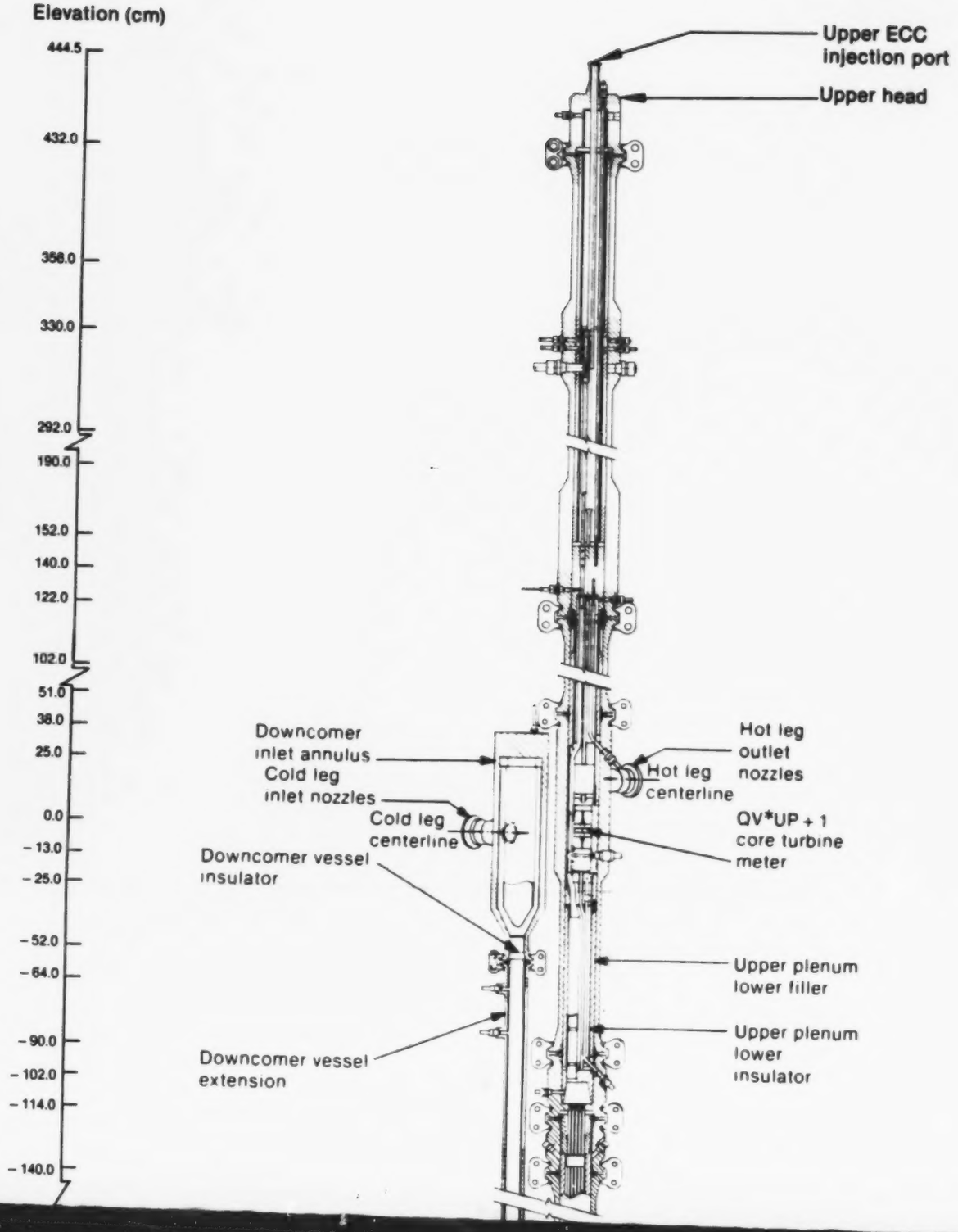


Figure 2. Semiscale Mod-2A system configuration for cold-leg intermediate-break test—schematic.

23-A

BEST DOCUMENT AVAILABLE

24



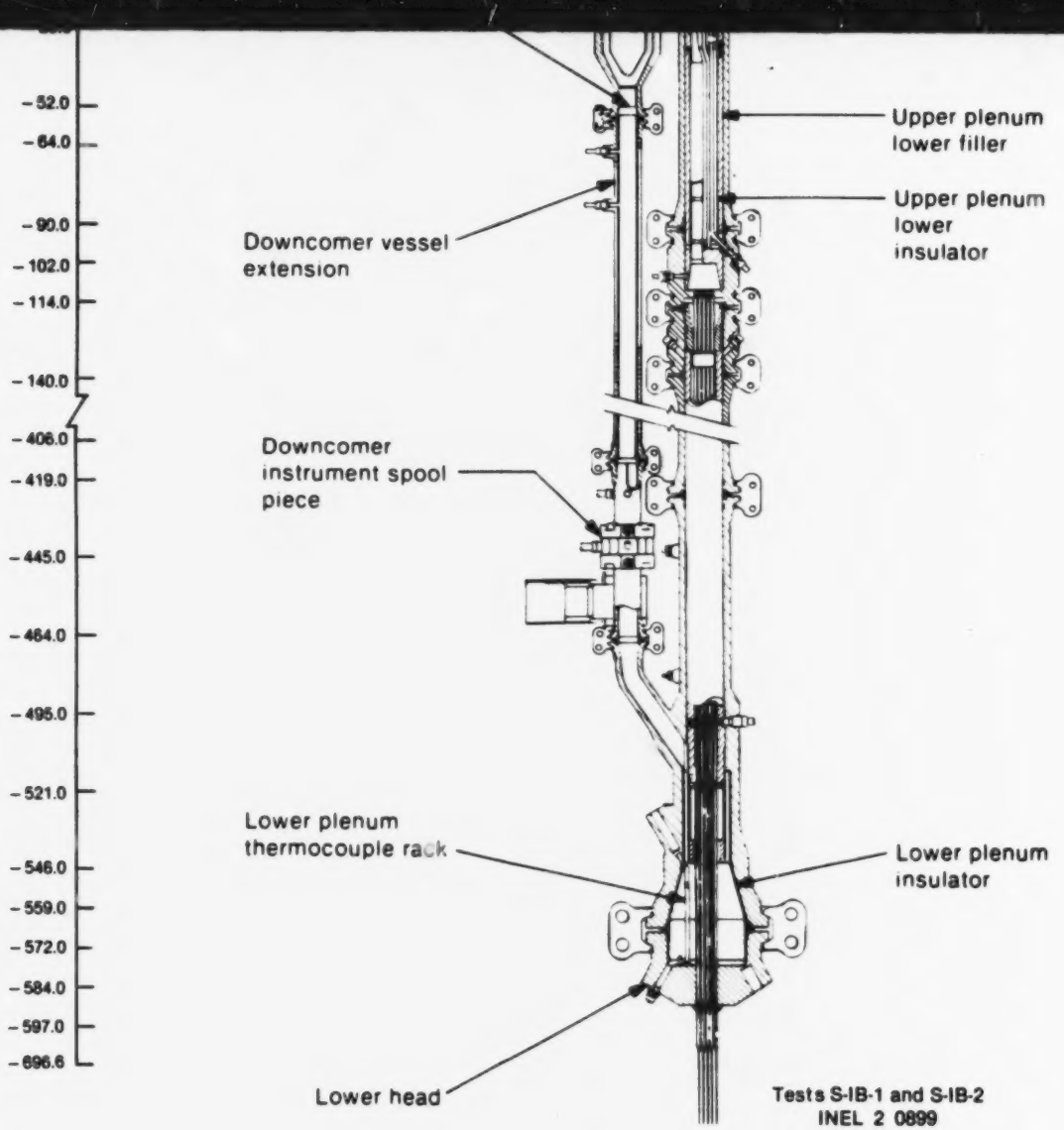


Figure 3. Semiscale Mod-2A pressure vessel and downcomer—cross section.

24-A

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

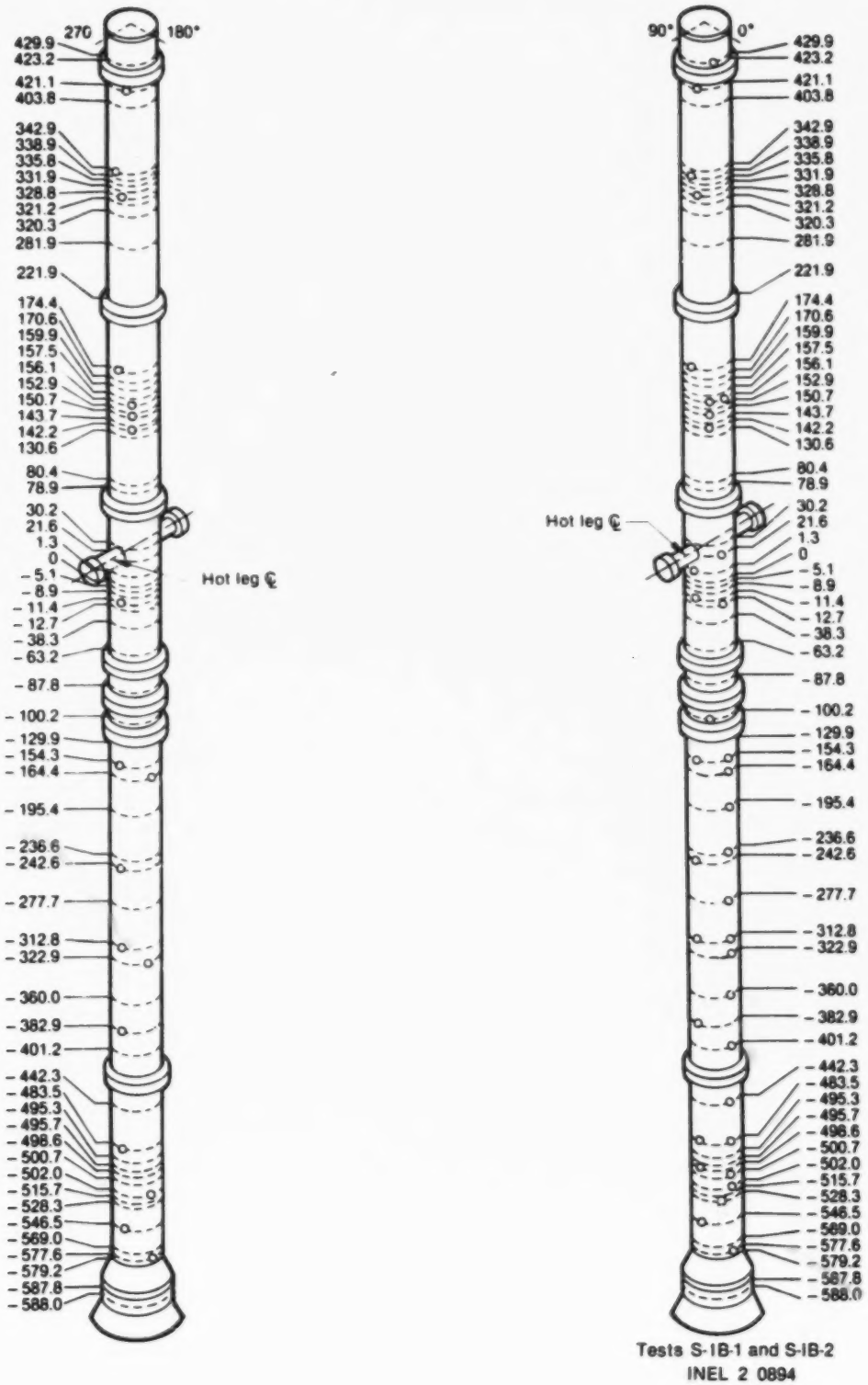


Figure 4. Semiscale Mod-2A pressure vessel showing penetrations—isometric.

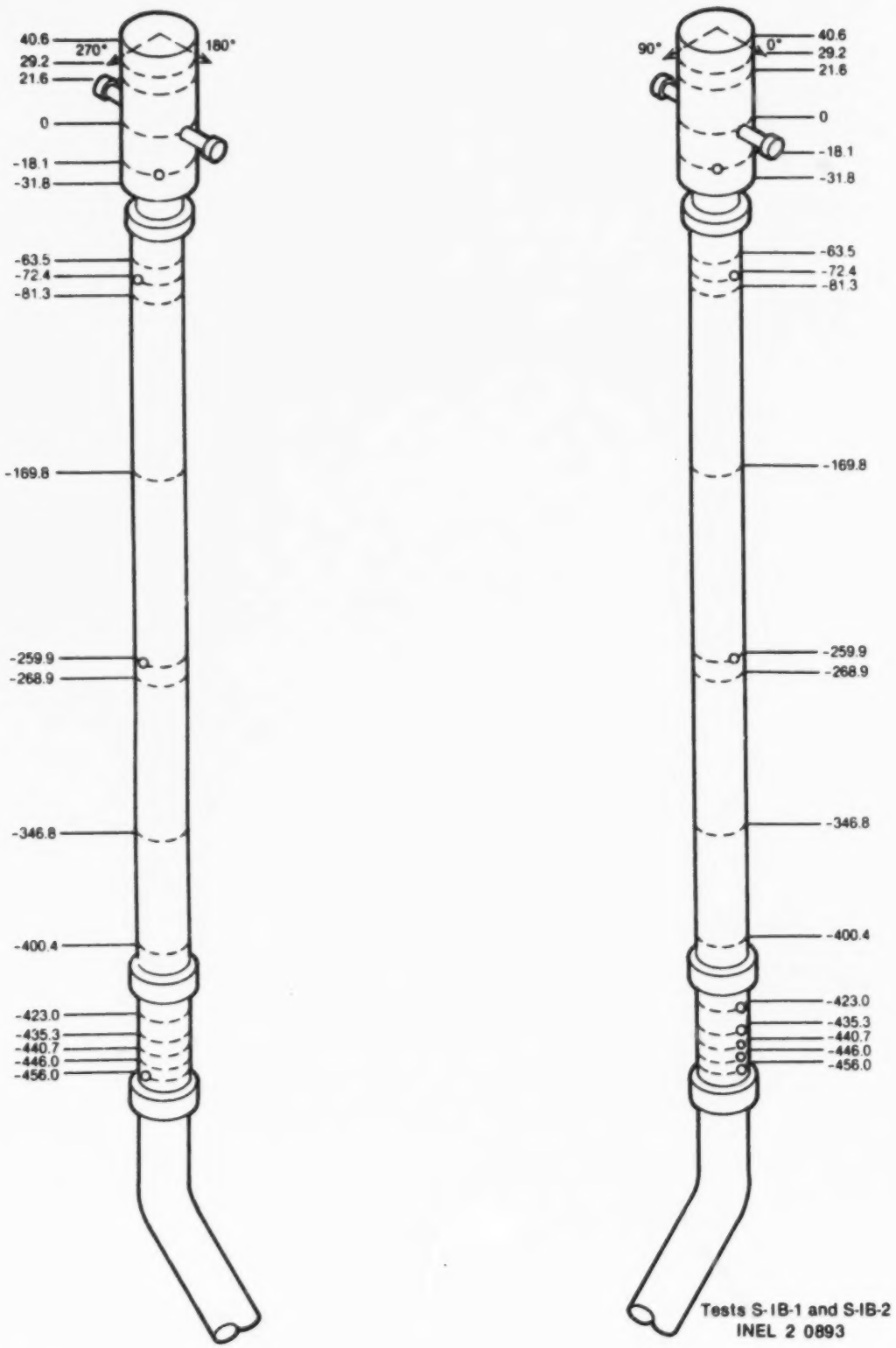


Figure 5. Semiscale Mod-2A downcomer showing penetrations—isometric.

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

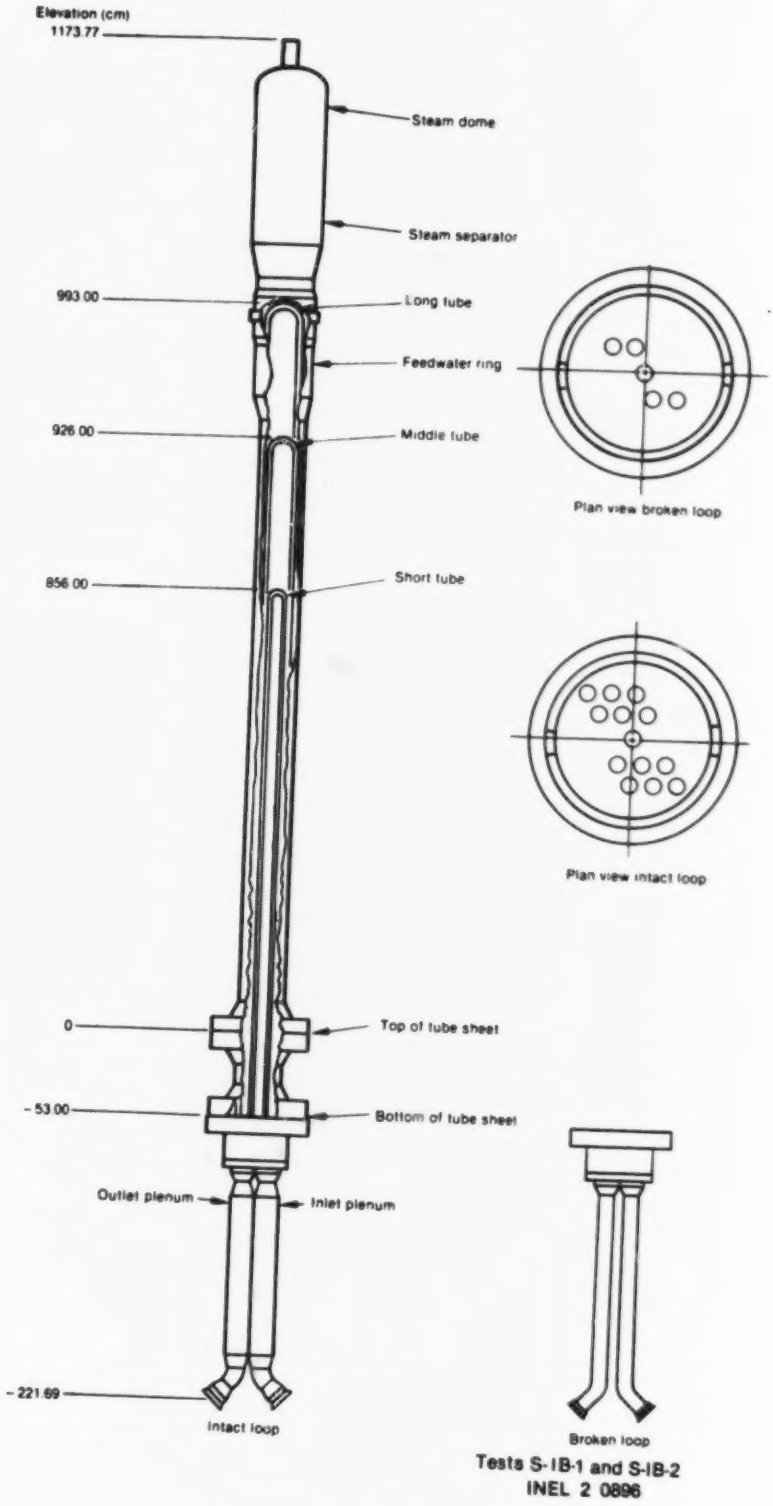


Figure 6. Semiscale Mod-2A steam generator—cross section.

BEST DOCUMENT AVAILABLE

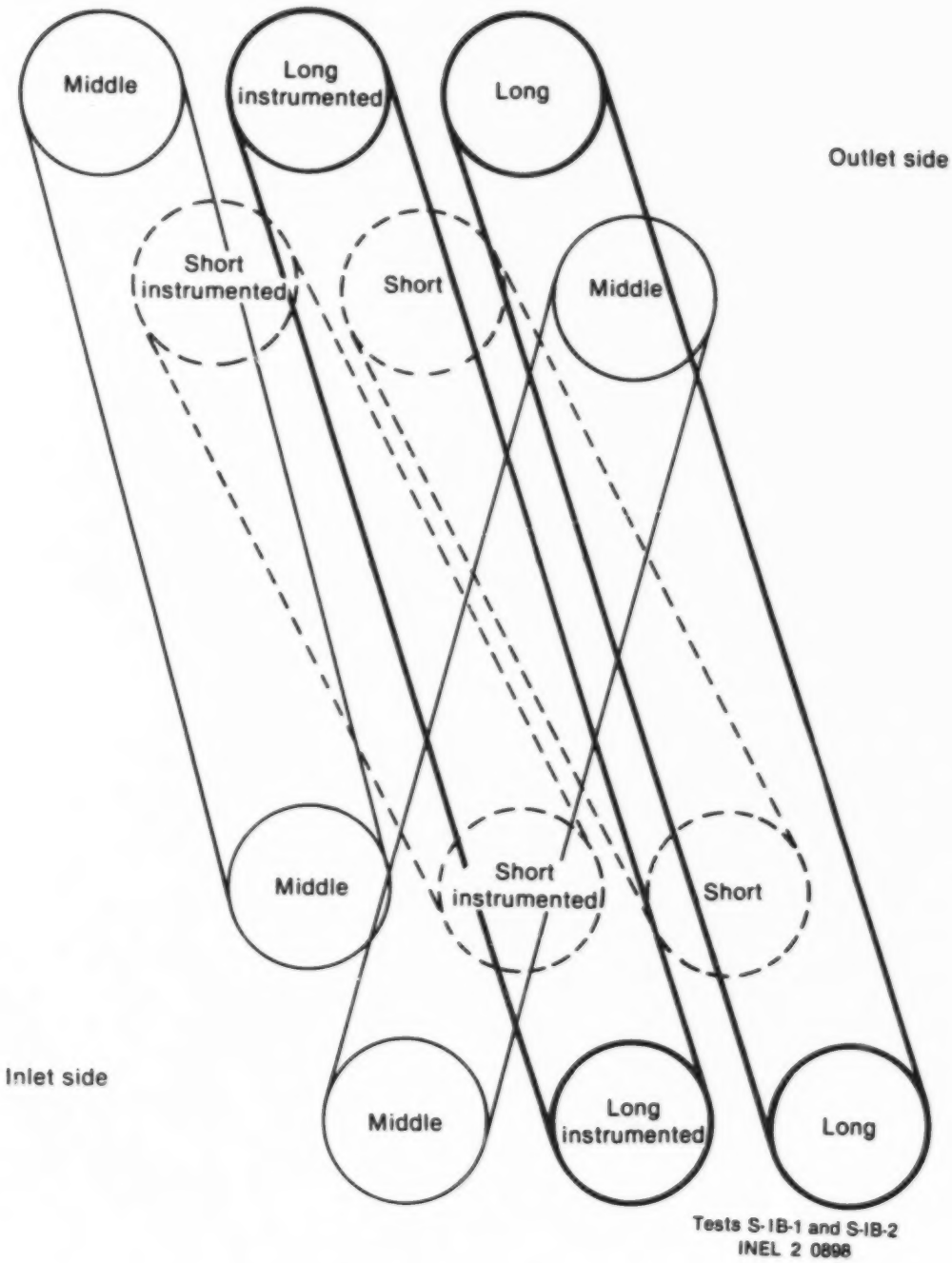


Figure 7. Semiscale Mod-2A intact loop steam generator tubes—horizontal cross section.

BEST DOCUMENT AVAILABLE

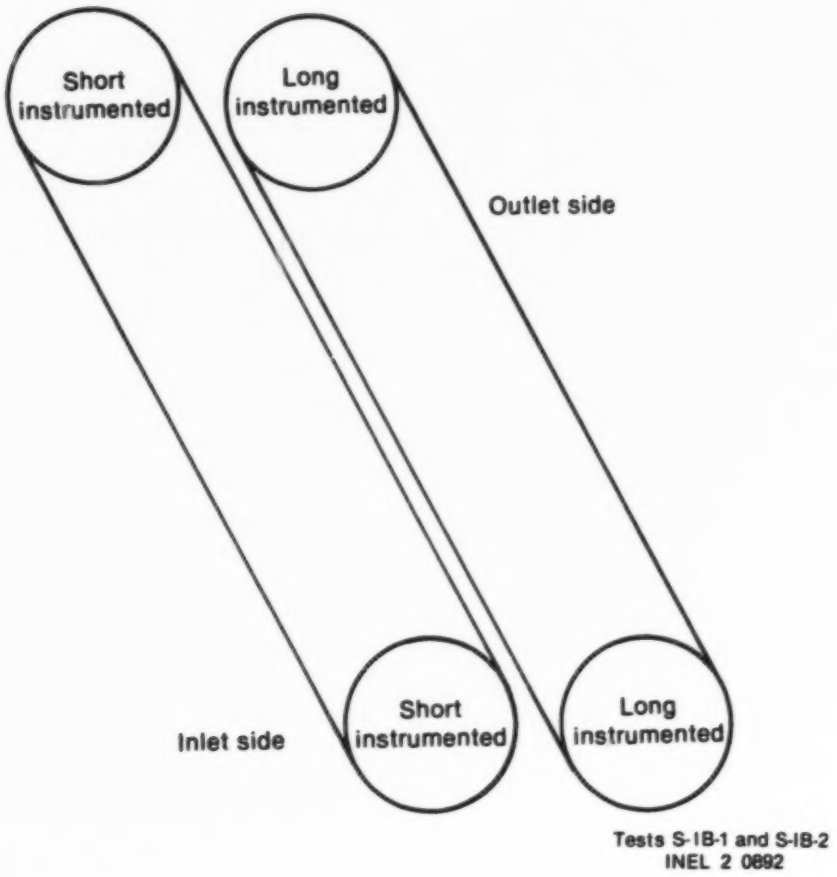


Figure 8. Semiscale Mod-2A broken loop steam generator tubes—horizontal cross section.

BEST DOCUMENT AVAILABLE

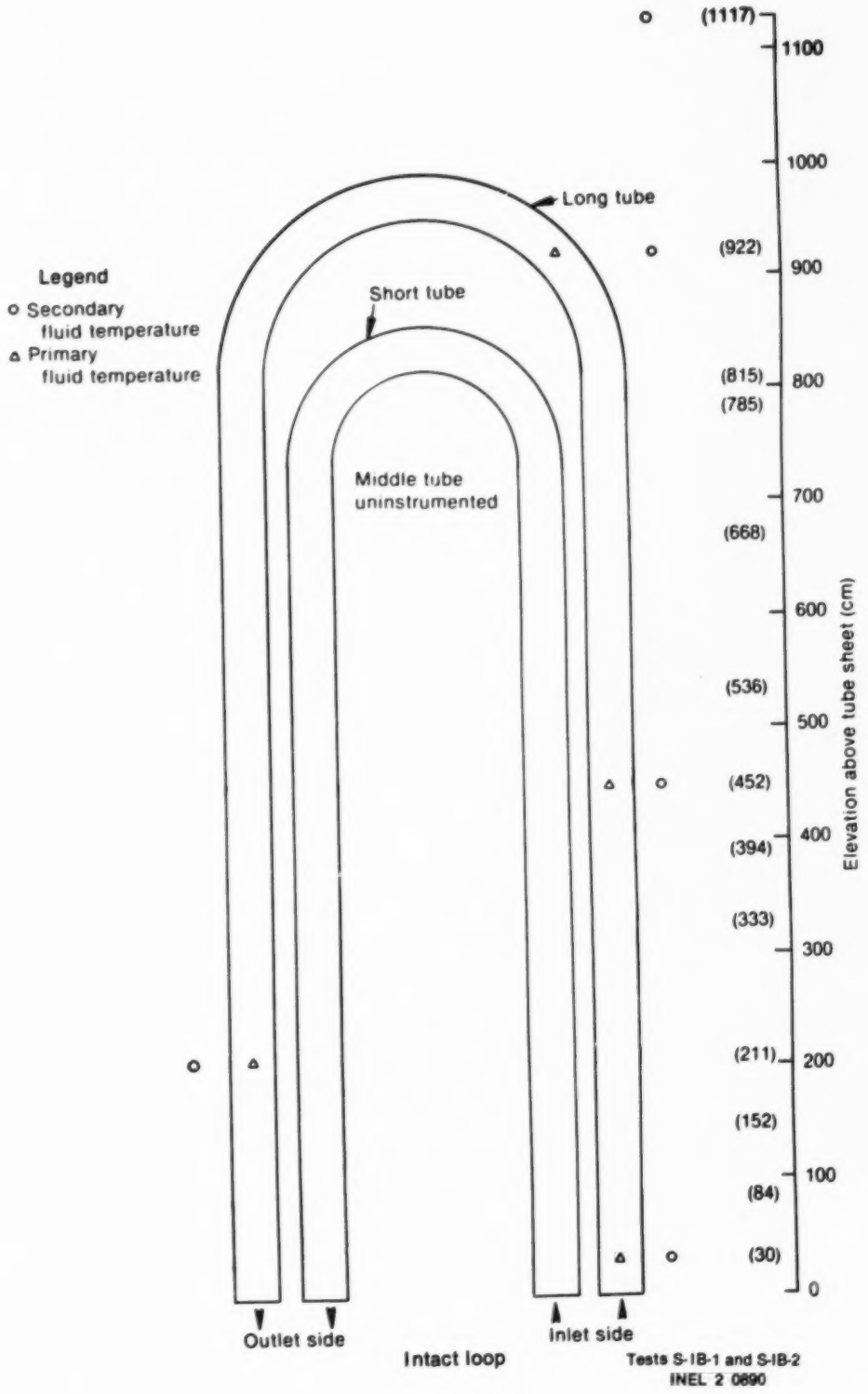


Figure 9. Semiscale Mod-2A intact loop steam generator thermocouple locations.

EST DOCUMENT AVAILABLE

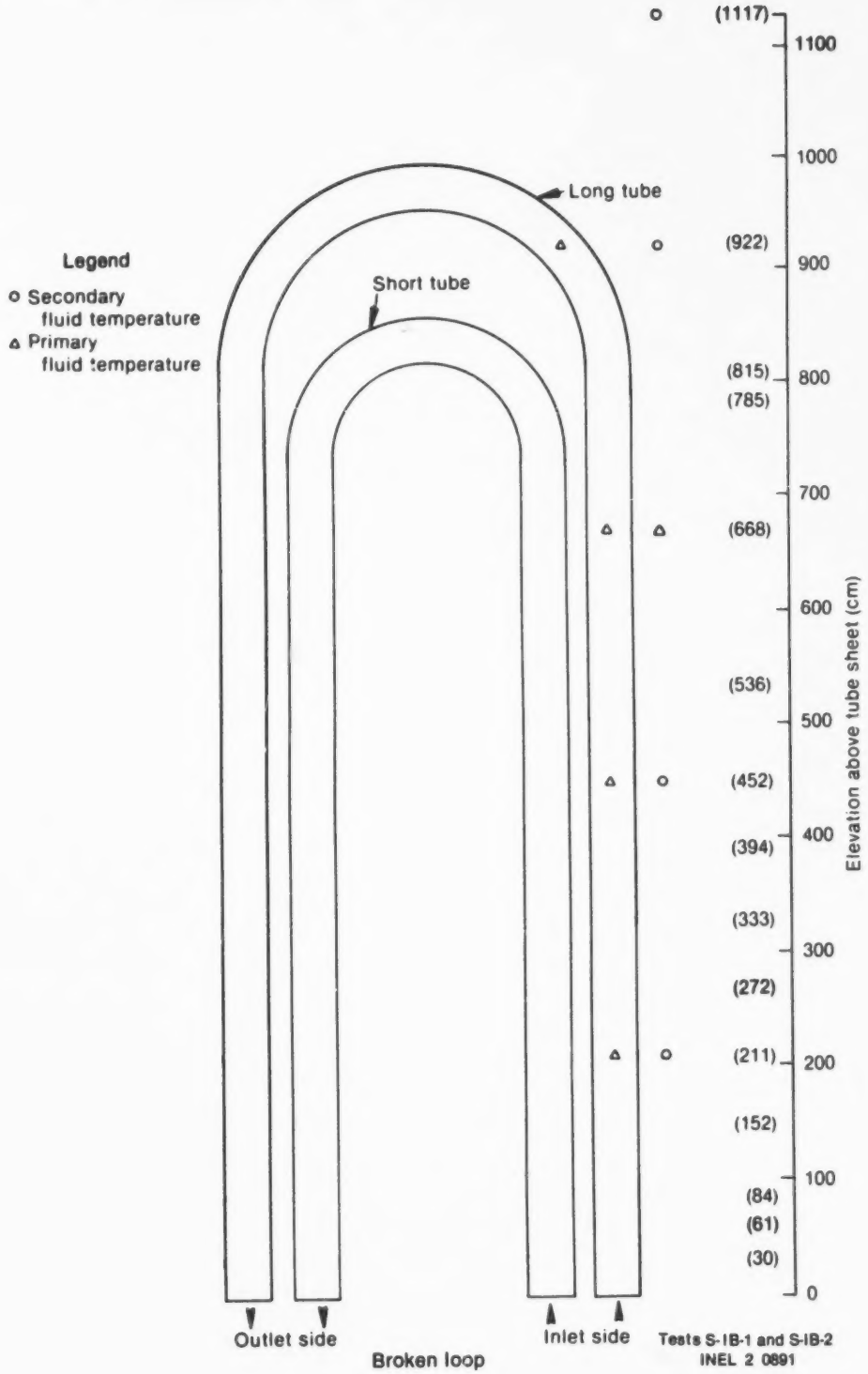


Figure 10. Semiscale Mod-2A broken loop steam generator thermocouple locations.

BEST DOCUMENT AVAILABLE

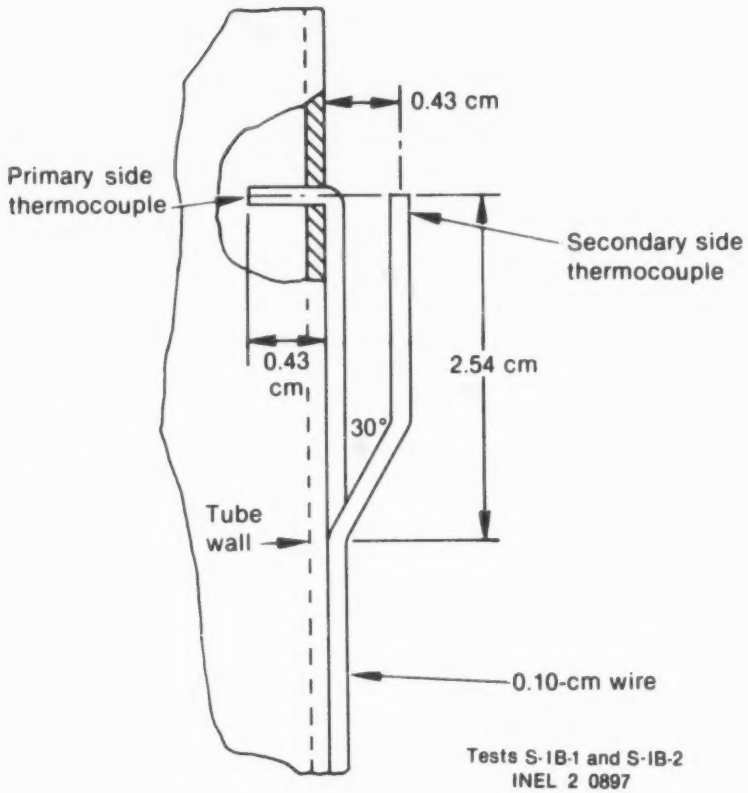


Figure 11. Semiscale Mod-2A intact and broken loop steam generator thermocouple installation.

BEST DOCUMENT AVAILABLE

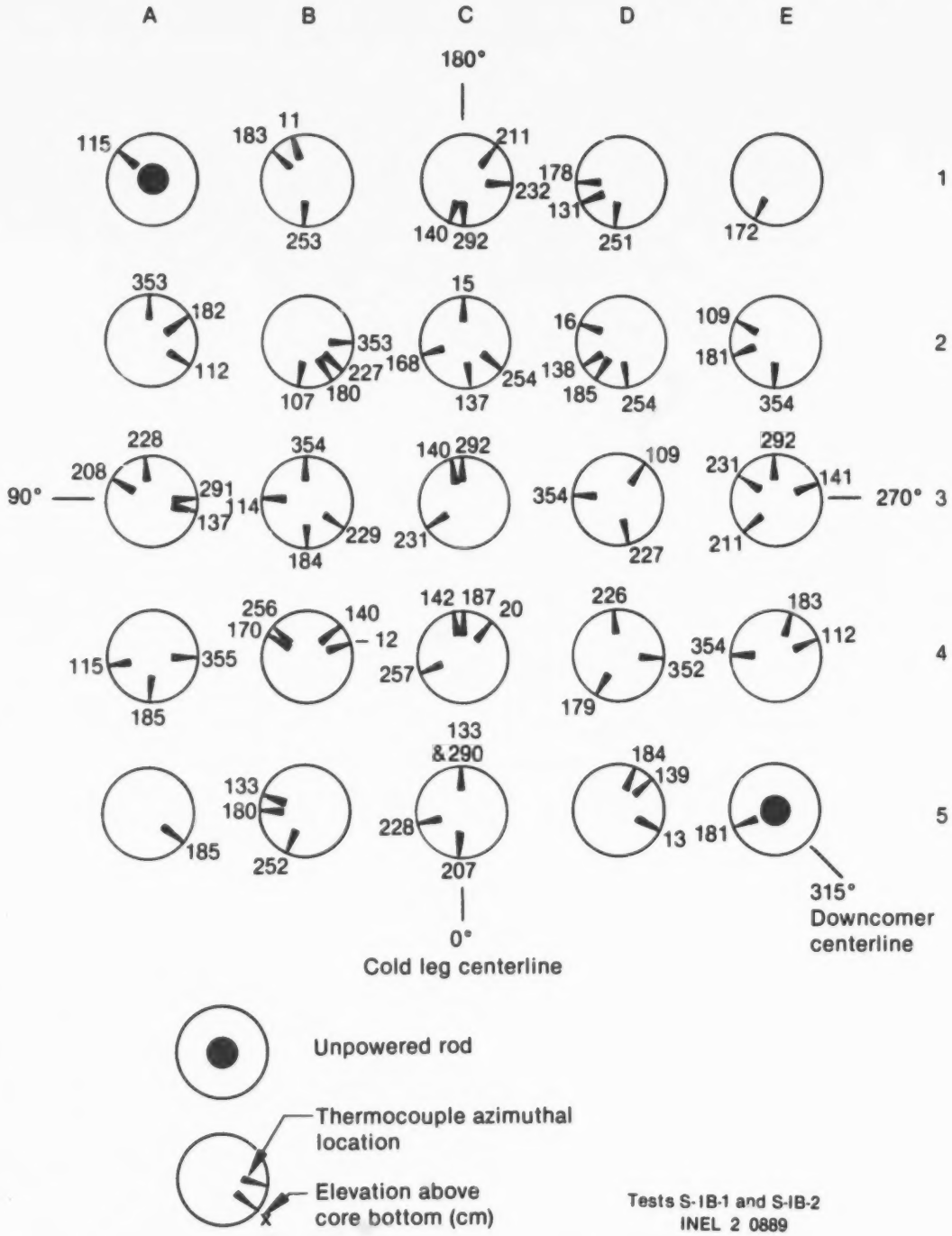


Figure 12. Semiscale Mod-2A heated core plan view.

4. REFERENCES

1. L. J. Ball et al., *Semiscale Program Description*, TREE-NUREG-1210, May 1978.

2. A. G. Stephens, *Experimental Operating Specifications—Semiscale Mod-2A Experiments S-IB-1 and S-IB-2*, EGG-SEMI-5722.

3. A. G. Stephens et al., *Quick Look Report for Semiscale Mod-2A Intermediate Break Test S-IB-1*, EGG-SEMI-5859.

4. A. G. Stephens et al., *Quick Look Report for Semiscale Mod-2A Intermediate Break Test S-IB-2*, EGG-SEMI-5859.

5. R. W. Golden, *Semiscale Uncertainty Report*, NUREG/CR-2459, EGG-2142, to be published.